User's Manual

Line Scan Camera

Type:XCM2080SAT4/XCM2040SAT4

NIPPON ELECTRO-SENSORY DEVICES CORPORATION

Introduction

Thank you for purchasing NED's Line Scan Camera. We look forward to your continued custom in the future.

For safety use

- For your protection, please read these safety instructions completely before operating the product and keep this manual for future reference.
- The following symbols appear next to important information regarding safe product handling.

Warning	If the product is not handled properly, this may result in serious injury or possible death.
Caution	If the product is not handled properly, this may result in physical injury or cause property damage.

Safety precaution

Warning

- Never disassemble or modify this product, unless otherwise specified to do so in this manual.
- When hands are wet, avoid handling this product and do not touch any of the connection cable pins or other metallic components.
- Do not operate this product in an environment that is exposed to rain or other severe external elements, hazardous gases or chemicals.
- If the product is not to be used for an extended period of time, as a safety precaution, always unplug the connection cable from the camera unit.
- If the product installation or inspection must be executed in an overhead location, please take the necessary measures to prevent the camera unit and its components from accidentally falling to the ground.
- If smoke, an abnormal odor or strange noise is emitted from the camera unit, first turn OFF power, then unplug the cable from the camera unit.
- This product is not intended for use in a system configuration built for critical applications.

Instructions before use

- Only operate this product within the recommended environmental temperature range.
- Use only the specified power source and voltage rating.
- Do not drop this product. Avoid exposure to strong impact and vibrations.
- Install the camera unit in a well-ventilated environment, in order to prevent the camera from overheating.
- If the camera must be installed in an environment containing dust or other particles, take required measures to protect the camera unit from dust adhesion.
- Do not unplug the cable while power is being supplied to the camera unit. To prevent product damage, always shut down the power supply before unplugging the power cable.
- When the surface of the camera window becomes dirty due to dust or grime, black smudges appear in the displayed image. Use an air blower to remove the dust particles. Dip a cotton swab into ethanol alcohol and clean the camera window. Be careful not to scratch the glass.
- Use of non-infrared lighting such as a fluorescent lamp is recommended. If halogen lighting is employed, always install an infrared filter into your system configuration.
- Please note that exposure to long wavelength light outside of the sensors visible optical range can affect the image.
- Sensitivity may fluctuate depending on the spectral response level of the light source. In cases like this, changing the light source to one with a different spectral response level may reduce this problem.
- For stabilized image capturing, turn ON the power supply and execute aging for ten to twenty minutes before actually using the camera unit.
- Do not share the power supply with motor units or other devices that generate noise interference.
- The signal ground (SG) and the frame ground (FG) are connected inside the camera unit. Design the system configuration so that a loop will not be formed by the ground potential differential.
- Do not disconnect the camera while rewriting an embedded memory.
- When you change exposure mode that is set at NED factory, input control signal (CC1) from the capture board.

Exclusion Clause

- The manufacturer assumes no responsibility for damages resulting from natural disasters, earthquakes, or acts executed by a third party. Warranty excludes any accidents resulting from improper handling or misuse of this product, whether intentional or not, and any camera operations conducted under abnormal conditions.
- The manufacturer assumes no responsibility for any incidental damages (loss of corporate profits, interruption of business, etc.) resulting form use or non-use of this product.
- The manufacturer assumes no responsibility for damages resulting from failure to follow the instructions and procedures indicated in this User's Manual.
- The manufacturer assumes no responsibility for any damages resulting from malfunctions caused by combined use of this product with other peripheral equipment.
- The manufacturer assumes no responsibility for damages resulting from malfunctions caused by non-authorized repair or modifications made to this product.

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1 Product Outline

1.1 Features（XCM2080SAT4/XCM2040SAT4）

- High speed readout 320MHz：XCM2080SAT4 / 160MHz：XCM2040SAT4
- Easy control of gain / offset / video output (8/10bit) with software outside the camera.
- Easy connection with a variety of frame grabber boards via Camera Link interface
- Single power source DC12V to 15 for operation
- It can correct the difference between bits and shading.

1.2 Application

- Inspection of Transparent panels and PCBs
- Visual inspection of high speed moving objects
- Flat panel display inspection
- Inspection of glass and sheet-like objects
- Printed circuit board inspection
- This camera utilizes an Intelligent Transportation System
- Outdoor surveillance

An example of Visual Inspection is shown below.

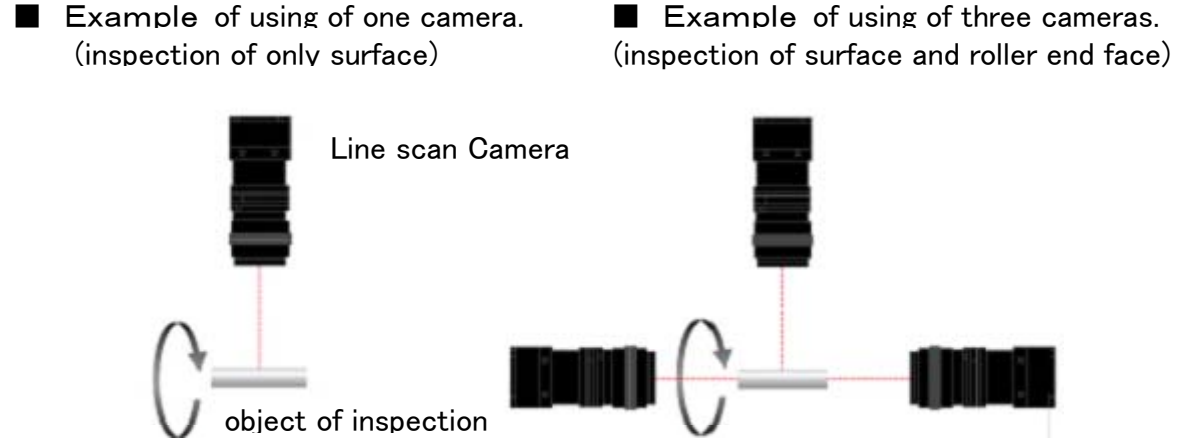

■ Example of using of one camera.
(inspection of only surface)
■ Example of using of three cameras.
(inspection of surface and roller end face)
Line scan Camera
object of inspection

Figure 1-2-1 Visual Inspection of PCBs

Object of inspection (example)

Metallic part of cylinder and conical geometry (surface and roller end face)

・Automobile component ・Architectural reinforcement parts
・Various pin parts

Typical detection item

・chip ・dent ・scratch ・chip of roller end face ・external dimensions

Device specification

1. Camera: Line scan camera of number of 2048 pixels
2. Controller: Dedicated software for PC system

1.3 Image Sensor

The camera adopts a CMOS sensor with the maximum data rate of 320MHz （XCM2080SAT4）/ 160MHZ（XCM2040SAT4）to acquire high quality images and highly sensitive.

Both of the pixel sizes are 14μmx14μm.

XCM2080SAT4 outputs its 2048 pixel data through 80MHz-4Tap or *80MHz-2Tap and 1024pixel data through 80MHz-2Tap.

XCM2040SAT4 outputs its 2048 pixel data through 40MHz-4Tap or *40MHz-2Tap and 1024 pixel data through 40MHz-2Tap.

The block diagram of the image sensor is shown below.

Note:

The maximum data rate becomes 1/2 at 4tap, when it output the data of 2048 pixels in 2tap.

Block Diagram of Image Sensor is shown below.

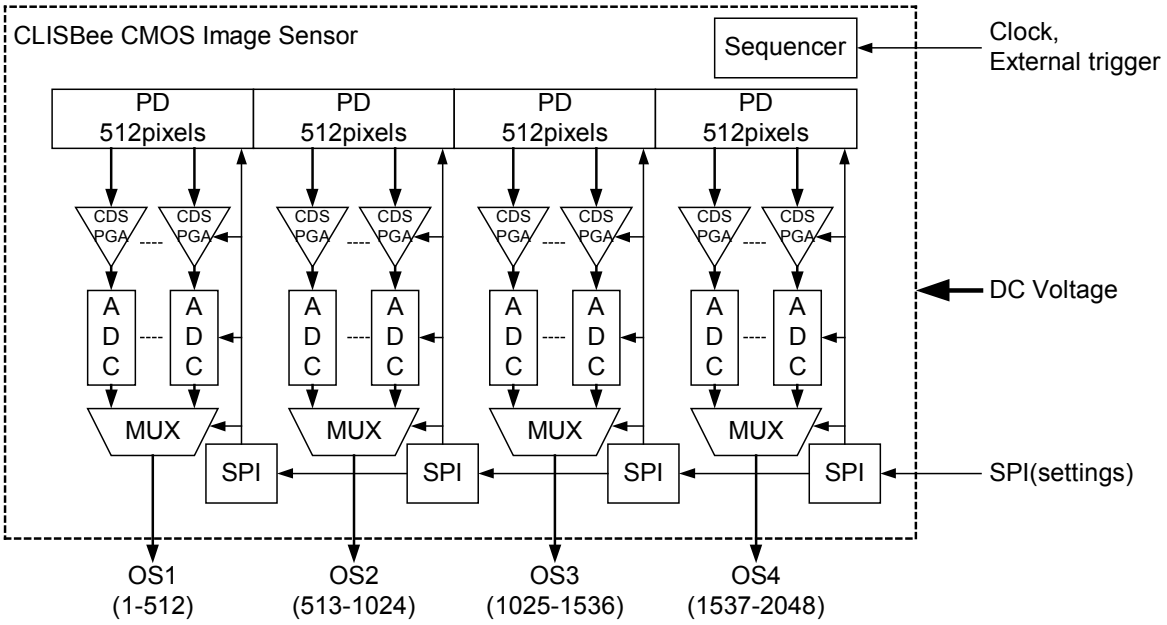


Figure 1-3-1 Block Diagram of Image Sensor

1.4 Performance Specifications

The Performance Specifications are shown in Table 1-4-1. It shows the data when the camera is operating at maximum scan rate, unless otherwise specified.

Table 1-4-1 Performance Specifications

Items			Specifications	
			XCM2080SAT4	XCM2040SAT4
Number of Pixels			2048 / 1024	
Pixel Size H x V (μm)			14 x 14	
Sensor Length (mm)			28.672(2K) / 14.336(1K)	
Spectral Responsivity (nm)			400～1000 *Peak 625	
DataRate (MHz)		2K: 4Tap	320	160
		1K,2K: 2Tap	160	80
Scan Rate (μs) / [kHz]		2K: 4Tap, 1K: 2Tap	8.0/[125.0]	16.0/[62.5]
		2K: 2Tap	14.7/[68.0]	29.4/[34.0]
Saturation Exposure (lx･s) (typically) [Minimum Gain, Pixel Correction Initial Value, Daylight Fluorescent Light]			0.1 * Visible Area (400～700nm)	
Responsivity (V/ [lx･s]) (typically) [Minimum Gain, Pixel Correction Initial Value, Daylight Fluorescent Light]			50 * Visible Area (400～700nm) * Analog 5V Conversion Sensitivity	
Gain Adjustable Range *Analog Amplifier +Digital			Analog Amplifier : x 1 to x 20 (7 Steps) Digital : x 1 to x 2 (512 Steps)	
Offset Adjustable Range *Digital			-15 to 15 DN (31Steps): 8bit -60 to 60 DN (31 Steps): 10bit	
Video output Camera Link		2K: 4Tap	Camera Link Medium Configuration	
		1K, 2K: 2Tap	Camera Link Base Configuration	
Control Input			CC1: External Trigger Signal, CC2-4: Not in use	
Connectors	Data/Controller		3M: MDR26 [Camera Link] x 2(CL1, CL2) *You can use only CL1 at 2Tap.	
	Power Supply		Hirose: HR10A (4Pin)	
Maximum Cable Length (m)			5	10
Lens Mount			Nikon F Mount (2K, 1K) or C Mount (1K)	
Operating Temperature (˚C) No Condensation			0 to 40	

Power Supply Voltage (V)	DC 12 to 15 [+/-5%]	
Consumption Current (mA) (typically)	390	320
Size W x H x D (mm)	60x100x73.5(F Mount) / 60x100x44.5(C Moun)	
Mass (g) (Camera only)	435 (F Moun) / 360 (C Moun)	
Additional Function	1 Shading Correction 2 Gain/Offset/Video Output Adjustable 3 Programmable Exposure Control 4 Scan Direction Switching	

Note :

*1) Tested under the following conditions.

i Camera Link Cable :14B26-SZLB-500-0LC by 3M (Full Configuration 5m)

ii Frame Grabber Board :SOL 6M FCE by Matrox(Solios : Medium Configuration compatible)

*2) DN : Digital Number (8bit : 0-255 / 10bit : 0-1023)

*3) Measurements were made at room temperature and daylight fluorescent light

The spectral responsivity is shown below.

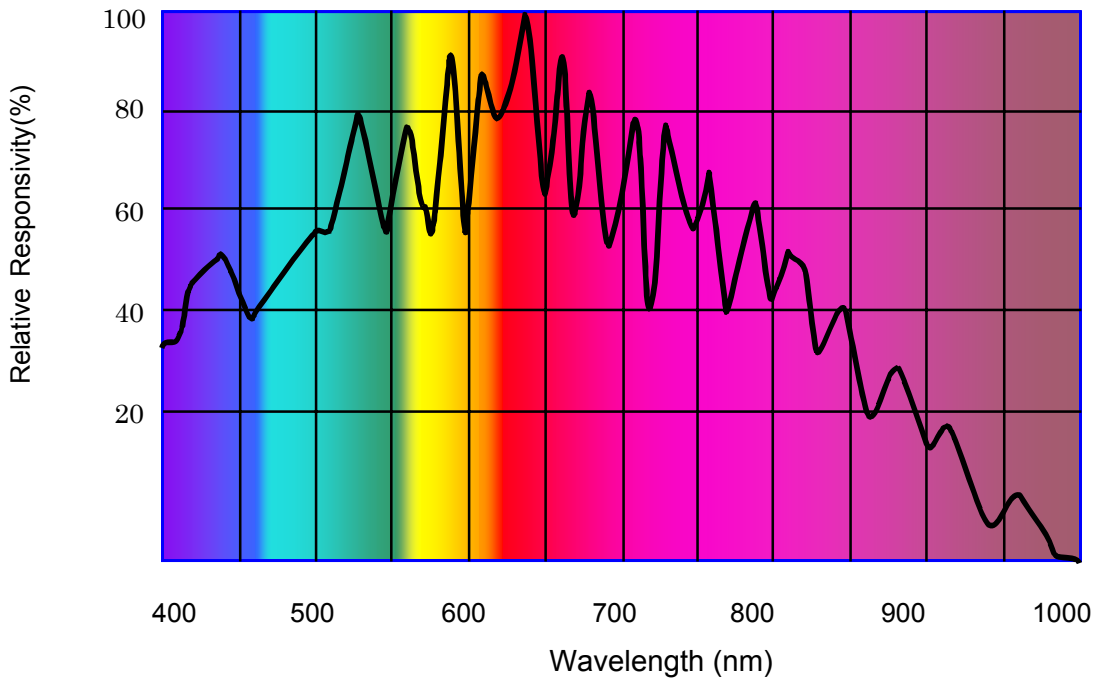


Figure 1-4-1 Spectral Responsivity

2 Camera Setting and Optical Interface

2.1 Setting the Camera

Use the M4 screw holes or the tripod screw hole to set the camera.

2.2 Fixing the Camera

Use the M4 screw holes (4 on the front, 8 on the side) to set the camera.

Or use the 1/4"-20UNC screw hole for a tripod (1 place at bottom).

If using the front panel M4 mounting holes (4 places at front, 8 places at side), the screw length for fixing the camera at the front should be less than 6mm.

No X-, Y-axis orientation and tilt adjustment mechanism is available. Please prepare an adjustment mechanism if required.

The dimensions of the camera are shown below.

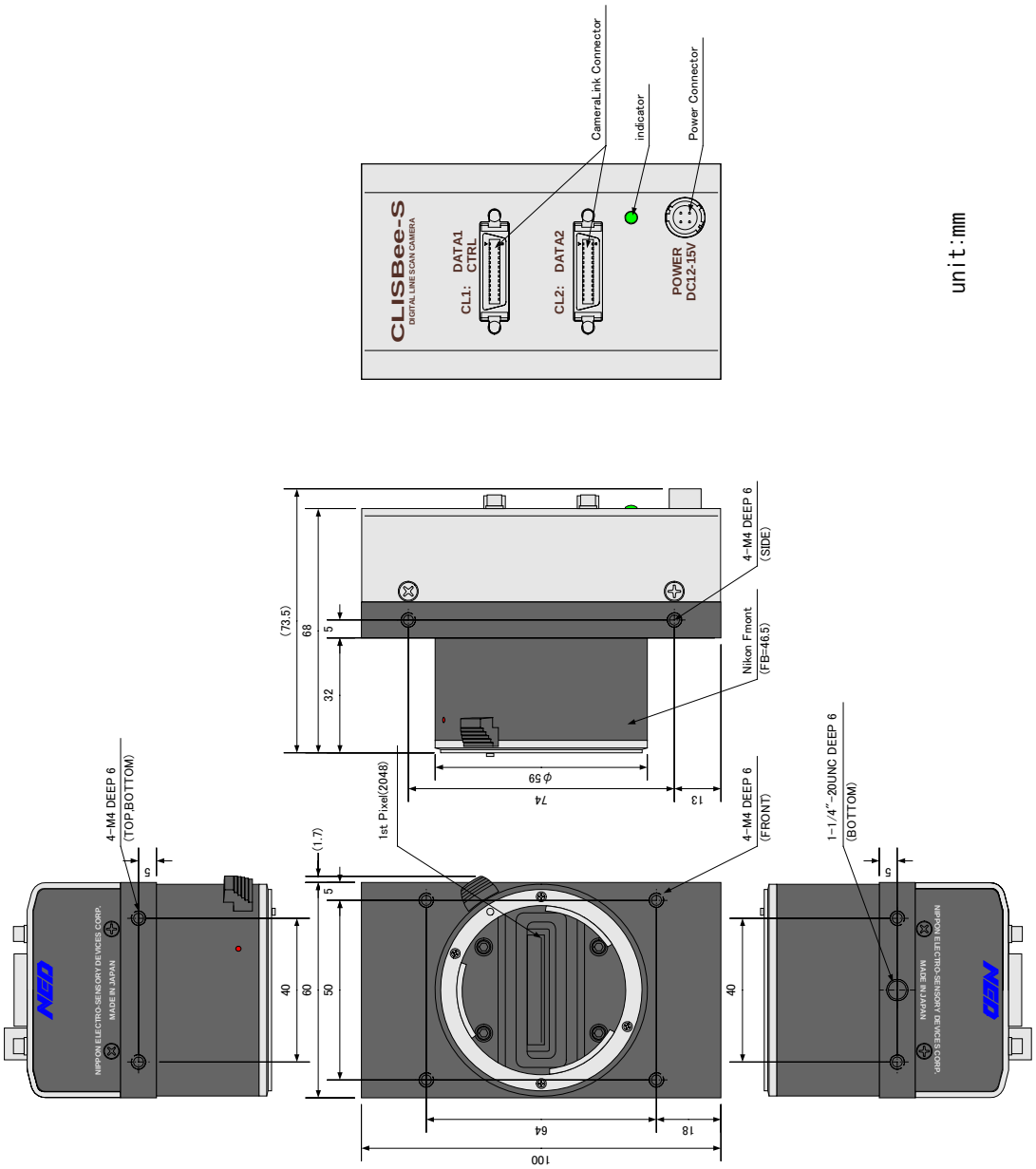


Figure 2-2-1 Dimensions of the Camera (F Mount)

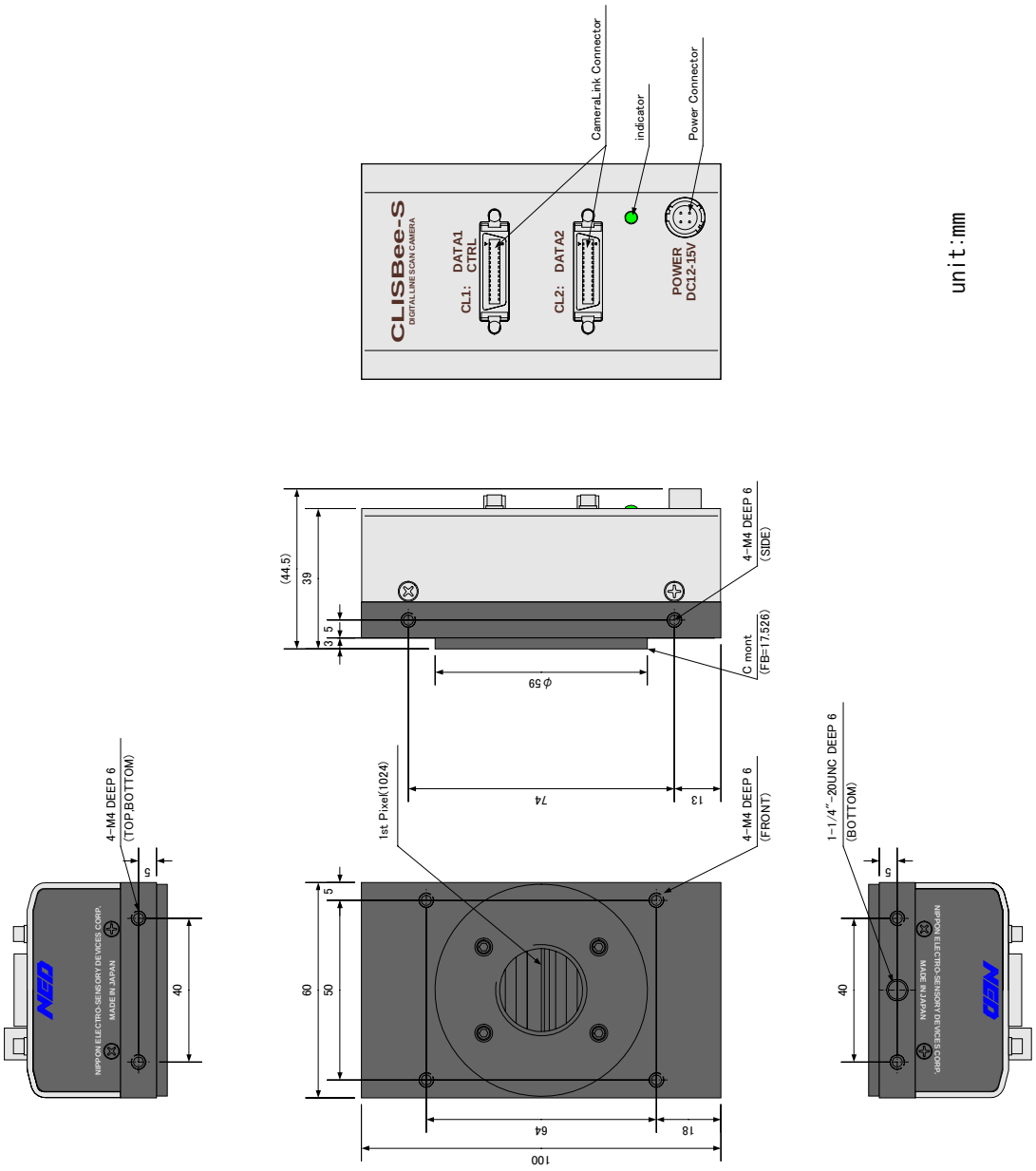


Figure 2-2-2 Dimensions of the Camera (C Mount)

2.3 Optical Interface

The mount that installs the lens is different according to the model of the camera. Nikon F mount is prepared as a standard issue, and when 1024 pixels are used, C mount can be selected.

Notes:

1）Quantities of light and the wavelength etc. of a source of light necessary to take the image for which the customer hopes are different according to the usage. The factor to decide these contains physical properties, the speed, the spectrum characteristic of the object taken a picture of, the exposure time, and the characteristic of the source of light and the specification etc. of the taking system.

It is a luminous exposure (exposure time × quantities of light) that it is important because an appropriate image is obtained. Please decide the exposure time and quantities of light after examining which element the customer values enough.

2) Keep these guidelines in mind when setting up your light source:

- LED light sources are relatively inexpensive, provide a uniform field and longer life span compared to other light sources. However, they also require a camera with excellent sensitivity.
- Halogen light sources generally provide very little blue light but have high infrared light (IR) proportions.
- Fiber-optic light distribution systems generally transmit very little blue light relative to IR.
- Metal halide light sources are very bright but have a shorter life span compared to other light sources.

3) Generally speaking, the brighter the light sources, the shorter the life span.

CMOS image sensors are sensitive to infrared (IR). We recommend using daylight color fluorescent lamps that have low IR emissions. If you use a halogen light source, to prevent infrared from distorting the images use an IR cutoff filter that does not transmit wavelengths.

3 Hardware

3.1 Camera Connection

Use the camera in the following way:

① Camera Link cables must be used to connect the camera unit with the frame grabber board.

Notes:

1） When it is used with 4Tap, the connection of the camera uses two cables for Camera Link. Please use the cable of the same manufacturer and the same length.

2） One cable for Camera Link is used when used with 2Tap.
Please connect it with the connector of CL1. (CL2 is unused.)

3） Use asymmetric Camera Link cables and connect the camera with the connector labeled as ”Camera side”.

4） There are two connectors in for Medium Configuration of Camera Link, please after confirming the specification of a frame grabber board and connect it.

② Connect the camera with the designated power supply.

Notes:

Use the designated power cable to connect the camera with the power source for the camera. Insert the plug end of the cable into the camera. Attach the opposite end (loose wires) to the power unit. Other than those above, a personal computer, a frame grabber board, a compatible lens, a lens mount, a light source and an encoder are necessary, depending on the situation.

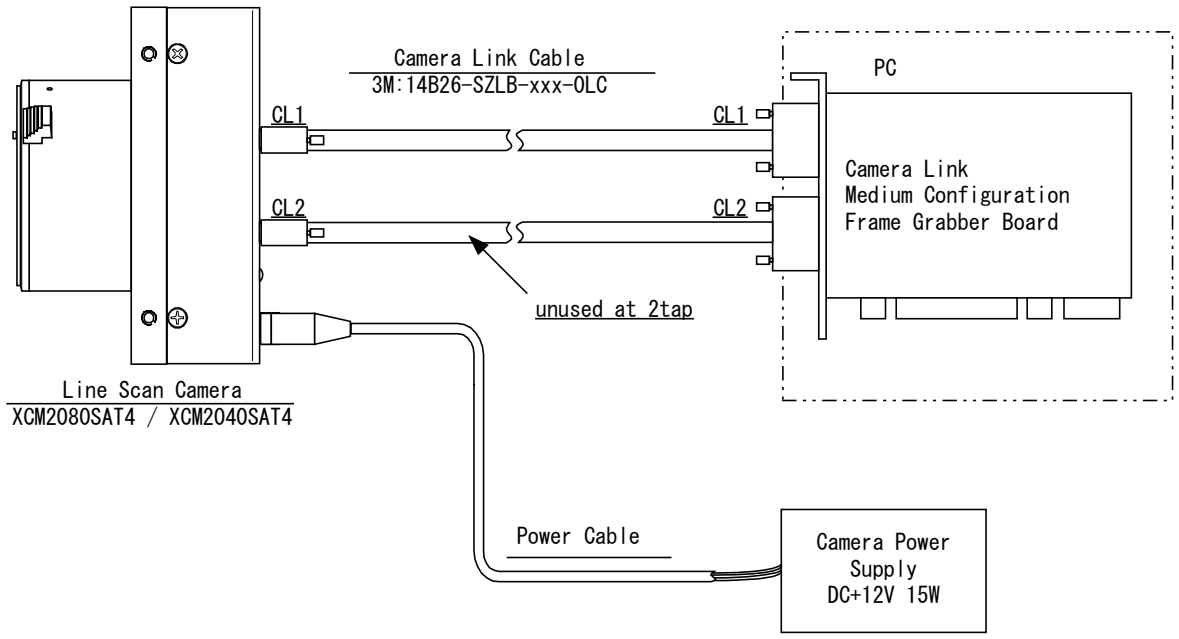


Figure 3-1-1 Connections between Camera and Frame Grabber Board and Power Supply

3.2 Input / Output Connectors and Indicator

The layout of input /output connecters and the LED indicator are as follows.

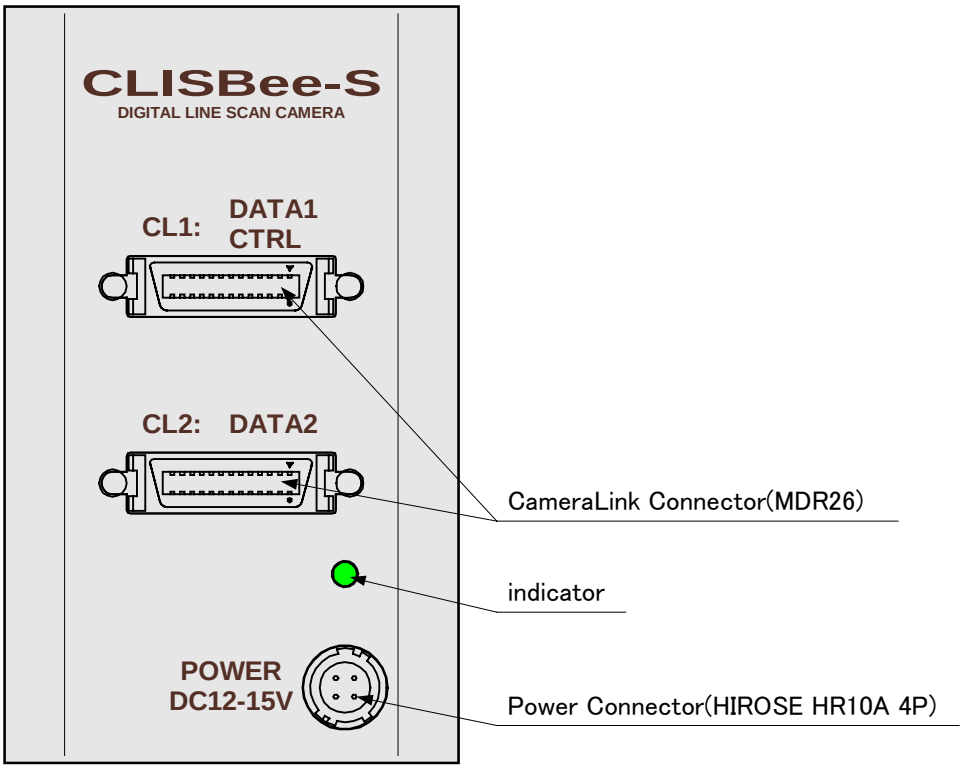


Figure 3-2-1 Input/Output Connectors and Indicator

3.3 Connectors・Pin Assignments・Cables

This camera adopts Medium Configuration of Camera Link interface standards. Figure 3-3-1 shows the interface for the camera and a typical implementation for the frame grabber interface.

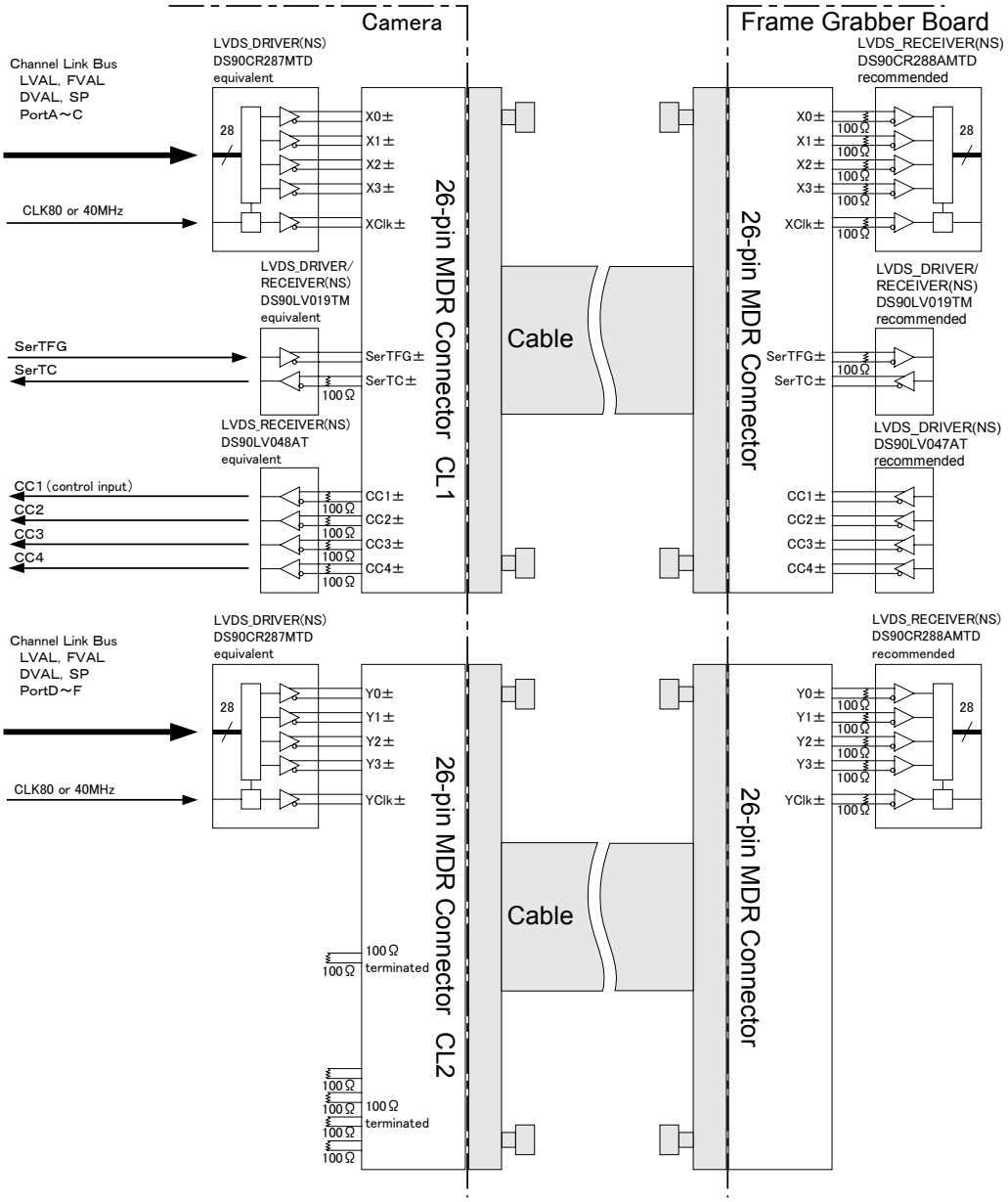


Figure 3-3-1 Camera / Frame Grabber Interface

Notes:

1) The cable is unnecessary in CL2 because it becomes Bese Configuration at 2Tap.
2) Do not make the driver side of LVDS open but set the logic to H or L, even if not used.
3) Set the LVDS, Channel Link receiver side to 100 ohm termination.

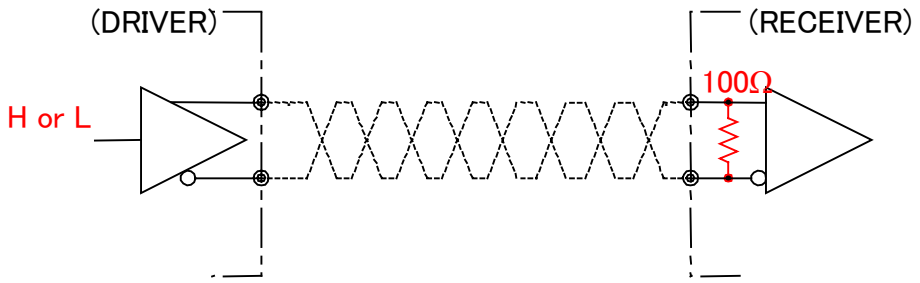


Figure 3-3-2 Circuit of LVDS

The camera has 26-pin MDR connectors for control signals of Camera Link, data signals and serial communications. The camera also has a 4-pin HIROSE connector for power supply.

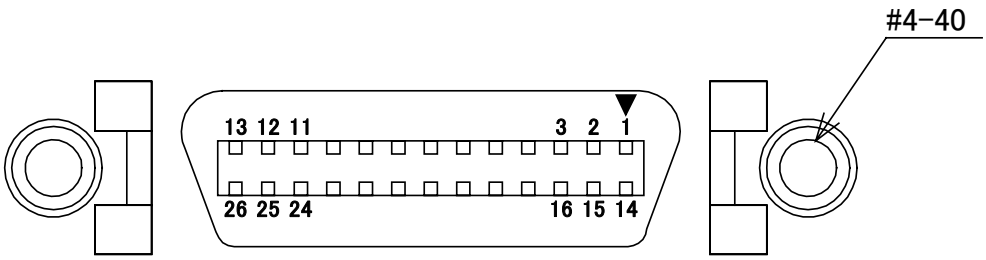


Figure 3-3-3 Camera Link Connector

Table 3-3-1 Camera Link Connector (26-pin MDR Connector) pin assignments

CL1(Base/Medium Configuration)

No	NAME	No	NAME	I/O
1	Inner Shield	14	Inner Shield	-
2	X0 -	15	X0 +	OUT
3	X1 -	16	X1 +	OUT
4	X2 -	17	X2 +	OUT
5	Xclk -	18	Xclk+	OUT
6	X3 -	19	X3 +	OUT
7	SerTC +	20	SerTC -	IN
8	SerTFG -	21	SerTFG +	OUT
9	CC1 -	22	CC1 +	IN
10	CC2 +	23	CC2 -	IN
11	CC3 -	24	CC3 +	IN
12	CC4 +	25	CC4 -	IN
13	Inner Shield	26	Inner Shield	-

CL2(Medium Configuration)

No	NAME	No	NAME	I/O
1	Inner Shield	14	Inner Shield	-
2	Y0 -	15	Y0 +	OUT
3	Y1 -	16	Y1 +	OUT
4	Y2 -	17	Y2 +	OUT
5	Yclk -	18	Yclk +	OUT
6	Y3 -	19	Y3 +	OUT
7	100Ω terminated	20	100Ω terminated	-
8	Open	21	Open	-
9	100Ω terminated	22	100Ω terminated	-
10	100Ω terminated	23	100Ω terminated	-
11	100Ω terminated	24	100Ω terminated	-
12	100Ω terminated	25	100Ω terminated	-
13	Inner Shield	26	Inner Shield	-

- Explanation of Signals

  Inner Shield : Shield cable (GND)

  X0+,X0-…X3+,X3- : Data output (Channel Link)

  Xclk+,Xclk-,Yclk +,Yclk - :Clock output for above data output synchronization (Channel Link)

  Y0+,Y0-…Y3+,Y3- : Data output (Channel Link)

  SerTC+, SerTC- : Serial data input (LVDS)

  SerTFG+, SerTFG- : Serial data output (LVDS)

  CC1+,CC1- : External synchronous signal input (LVDS)

  CC2+,CC2-, CC3+,CC3-, CC4+,CC4-:Not in use (LVDS)

- Camera Link compatible cable

  3M :14B26 -SZLB - xxx - 0LC by or equivalent

  Notes:

  1） To avoid uncoupling of the cable connectors during power on, make sure to clamp them with the locking screws.

  2） Do not unplug the cables while power is being supplied to the camera.

This camera uses 4-pin round shape push-pull lock type connector for the Power Supply

Figure 3-3-4 Power Supply Connector (HIROSE: HR10G-7R-4PB)

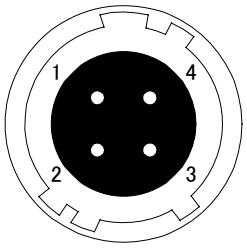


Table 3-3-2 Pin Assignment of Power Supply Connector

No	NAME	Color of Cable
1	12 -15V	White
2	12 -15V	Red
3	GND	Green
4	GND	Black

Notes:The cable color in the table shows acceptable cable DGPS-10.

3.4 Power Supply

The camera requires a single power supply (DC+12 to +15V).

The indicator (LED green) blinks when supplying power, and it will change into lighting in about two seconds.

Notes:

1) When selecting a power source, choose one with the capacity to allow for inrush current. (15W or more recommended)
2) Insert the cable plug securely until it locks into position. This is to prevent the connector from coming loose during power transmission.
3) Please confirm whether you turn off the power supply at once and there is problem in the voltage and the capacity etc. of wiring and the power supply when the indicator (LED green) doesn't light even if it supplies power.
4) I will recommend the shield processing of the power cable to be connected with GND on the power supply side.

AcceptableCable (Acceptable plug): DGPS10 (HIROSE:HR10A-4S)
Power supply voltage: DC+12 -15V (+/-5%)
Consumption Current (rated): DC+12V : 390mA(XCM2080SAT4)
DC+12V : 320mA(XCM2040SAT4)

4 Camera Control

The camera can be controlled through the serial communication. Two methods can be used to change the camera's parameters. The first approach is to change parameters using CLISBeeCtrl (Camera control software). (See "8 CLISBeeCtrl".) Or you can also change the parameters directly from your application by using binary read/write commands to set values in the camera register.

Once the camera has been set up according to your requirements, the camera can be used to read data without need of controlling it via the serial interface.

4.1 Flow of Camera Control

4.1.1 Command Overview

The serial interface uses a simple ASCII-based command.

- Communication begins when the computer sends control commands to the camera.
- The camera receives and interprets the computer commands and then executes control operations accordingly.
- Transmission ends when the camera returns the analyzed results of the control commands to the computer.
- ◆ Always allow the previous transmission to end before starting the next transmission. (Only one command can be sent per transmission.)

4.1.2 Camera Receiving Message (PC Sending Command)

- Format S1 CMD CR
- Format S2 CMD □ VAL 1 CR
- Format S3 CMD □ VAL 1 □ VAL2 CR

CMD**:** Control text (3 Bytes) Use 3 lowercase letters only. No numerals allowed.
CR**:** Carriage Return (0x0D)
□**:** Space (0x20) or Comma (0x2C)
VAL1**:** Setting value (decimal) the character is not used.
VAL2**:** Setting value (decimal) the character is not used.

4.1.3 Camera Sending Message (PC Receiving Message)

- Format R 1 >R CR >[SB] CR EOT
- Format R 2 >R CR >[MEM] CR >[SB] CR EOT

> **:** Results start text (0×3E)
R**:** Camera receive command analyzed results (See table 4-1-3-1)
[SB] **:** Camera receive command send back
[MEM] **:** Memory data readout value
CR**:** Separated text (0×0D)
EOT**:** Send command all text end text (0×04)

Table 4-1-3-1 Error Messages

Camera Response	Meaning
OK	Camera executed command
CMD ERR!	Command is not valid
CMD OVR ERR!	Command text line is too long When the control character exceeds 254 characters
VAL ERR!	Parameter accepted was outside of specified
MEM ERR!	Camera memory error
TRG ERR!	When the scanning interval becomes more than between a few seconds when arbitrary pixel correction data is acquired

4.1.4 Camera Control Commands

Table 4-1-4-1 shows the list of Camera Control Commands.

Table 4-1-4-1 Lists of Camera Control Commands

Control Item	CMD	VAL1	VAL2	Control Description
Analog Gain	gax	0 to 6		x1,x2,x4,x8,x10,x12,x20
Digital Gain	gdx	0 to 511		x1...x2(x0.003906/step)
Digital Offset	odx	-15 to 15		-15...15(1DN/step at8bit) -60...60(4DN/step at10bit)
Exposure Mode	inm	0 /1/2		Free Run / Ext Edge / Ext Level
Programmable Exposure Time (Dividing, Counter)	int	2/4	134～32767	6.7～3276.7μs（XCM2080SAT4） 13.4～6553.4μs（XCM2040SAT4）
Output Signal Setting	voa	0 /1	0～2	8bit /10bit 2048-pixel 4Tap / 1024-pixel 2Tap 2048-pixel 2Tap
Test Pattern	tpn	0 /1		OFF/ON
Pixel Correction Setting	shc	0/1/2	0 to1023	0:Correction data OFF /1:Factory correction data /2:User arbitrary correction data, User correction target value (10-bit)
Scanning Direction	rev	0 /1		0: Forward / 1: Reverse
Memory Initializing	rst			Reset to factory settings
Memory Load	rfd			Readout setup data in memory
Memory Save	sav			Store present setup data in memory
Pixel Correction Data Save	wht			Arbitrary user's correction data is acquired and stores it in the memory.
Operation Status Readout	sta			Returns the current camera settings.

4.1.5 Memory Setup Values (Factory Settings)

The memory setup values (factory settings) are shown in Table 4-1-5-1.

Table 4-1-5-1 Memory Setup Values (Factory Settings)

Control Item	CMD	VAL1	VAL2	Control Description
Analog Gain	gax	1		x2（6dB）
Digital Gain	gdx	0		x1
Digital Offset	odx	0		0DN
Exposure Mode	inm	0		Free Run
Programmable Exposure Time	int	2	1974	98.7μs（XCM2080SAT4） 197.4μs（XCM2040SAT4）
Output Signal Setting	voa	0	0	8bit, 2048pixel 4Tap
Test Pattern	tpn	0		OFF
Pixel Correction Setting	shc	1	512	Factory correction data ON, User correction target value 512DN (10bit)
Scanning Direction	rev	0		Forward

4.2 Details on Commands

4.2.1 Setting Analog Gain

Sets analog gain in 7 steps between x 1 and x 20.

- Format S2 CMD □ VAL1 CR Format R1 >R CR >[SB] CR EOT
- CMD gax
- VAL 0 (x1) to 6 (x20)

<Example>

gax □ 5 CR (Setting analog gain 5(x12))
>OK CR
>gax □ 5 CR EOT

4.2.2 Setting Digital Gain

Sets digital gain in 512 steps between x 1 and x 2.

- Format S2 CMD □ VAL1 CR, Format R1 >R CR >[SB] CR EOT
- CMD gdx
- VAL 0(x 1) to 511(x 2)

<Example>

gdx ☐ 255 CR (Setting digital gain 255(1023/(1023-255)=x1.33))
>OK CR
>gdx ☐ 255 CR EOT

4.2.3 Setting Digital Offset

Sets digital offset -15 to 15(1DN/step at 8bit), -60 to 60(4DN/step at 10bit)

- Format S2 CMD □ VAL1 CR, Format R1 >R CR >[SB] CR EOT
- CMD odx
- VAL -15 to 15

<Example>

odx □ 5 CR (Setting digital offset 5[20DN at 10-bit])
>OK CR
>odx □ 5 CR EOT

4.2.4 Setting Exposure Mode

Sets the exposure mode.

- Format S2 CMD □ VAL1 CR , Format R1 >R CR >[SB] CR EOT
- CMD inm
- VAL 0,1,2

<Example>

inm □ 0 CR (Setting the exposure mode free run)
>OK CR
>inm □ 0 CR EOT

4.2.5 Setting Exposure Time

Sets the exposure time.

Format S3 CMD □ VAL1 □ VAL2 CR, Format R1 >R CR >[SB] CR EOT

- CMD int
- VAL1 2,4 (Setting Dividing)
- VAL2 134～32767 (Setting Counter value)

<Example>

int □ 2 □ 456 CR (Setting exposure time 22.8μs:for XCM2080SAT4)
>OK CR
>int ☐ 2 ☐ 456 CR EOT

Note:

See 4.9.1.1 for the calculation of the exposure time.

4.2.6 Setting Output Signals (Setting Data Format)

Sets the data format of output signals.

- Format S3 CMD □ VAL1 □ VAL2 CR, Format R1 >R CR >[SB] CR EOT
- CMD voa
- VAL1 0,1 （0:8bit ,1:10bit）
- VAL2 0,1,2（0:2048 pixel 4Tap, 1:1024pixel 2Tap,2:2048 pixel 2Tap）

<Example>

voa □ 0 □ 2 CR (8bit, 2048 pixel 2Tap output)
>OK CR
>voa ☐ 0 ☐ 2 CR EOT

4.2.7 Setting the Pixel Readout Direction

Sets the pixel readout direction.

- Format S2 CMD □ VAL1 CR, Format R1 >R CR >[SB] CR EOT
- CMD rev
- VAL1 0,1 (0:Forward, 1:Reverse)

<Example>

rev □ 1 CR (Reverse)
>OK CR
>rev ☐ 1 CR EOT

4.2.8 Saving Pixel Correction Data

Acquires the current pixel correction data and saves it in the flash memory. One correction data can be saved at each step of analog gain.

- Format S1 CMD CR, Format R1 >R CR >[SB] CR EOT
- CMD wht

<Example>

wht CR
>OK CR
>wht CR EOT

4.2.9 Setting Pixel Correction

Sets pixel correction.

- Format S3 CMD □ VAL1 □ VAL2 CR, FormatR1 >R CR >[SB] CR EOT
- CMD shc
- VAL1 0,1,2 (0:Correction OFF / 1: Factory correction data ON / 2: User correction target value ON)
- VAL2 0 to 1023 (Setting user correction target value:10bit)

<Example>

shc □ 2 □ 700 CR (User correction target value is 700DN)
>OK CR
>shc □ 2 □ 700 CR EOT

4.2.10 Generating Test Pattern

Generates test pattern.

- Format S2 CMD □ VAL1 CR , Format R1 >R CR >[SB] CR EOT
- CMD tpn
- VAL 0,1 (0:Image data, 1: Test pattern)

<Example>

tpn □ 1 CR (Generating test pattern)
>OK CR
>tpn □ 1 CR EOT

4.2.11 Memory Initializing (Initializing Camera Settings)

Reset the flash memory to the factory default.

- Format S1 CMD CR, Format R2 >R CR >[MEM] CR >[SB] CR EOT
- CMD rst

<Example>

rst CR
>OKCR
>Type=XCM2080SAT4 CR
>Ver.=1.00_0x8012 CR
>Serial=123456 CR
>Sensor=12 CR
>Background Offset=3 CR
>Latter Harf of Tap Order=0 CR
>gax 1 CR
>gdx 0 CR
>odx 0 CR
>inm 0 CR
>int 2,1974 CR
>voa 0,0 CR
>tpn 0 CR
>shc 1,512 CR
>rev 0 CR
>rst CR EOT

4.2.12 Memory Load

Reads out the camera settings from the flash memory.

- Format S1 CMD CR, Format R2 >R CR >[MEM] CR >[SB] CR EOT
- CMD rfd

<Example>

rfd CR
>OKCR
>Type=XCM2080SAT4 CR
>Ver.=1.00_0x8012 CR
>Serial=123456 CR
>Sensor=12 CR
>Background Offset=3 CR
>Latter Harf of Tap Order=0 CR
>gax 1 CR
>gdx 0 CR
>odx 0 CR
>inm 0 CR
>int 2,1974 CR
>voa 0,0 CR
>tpn 0 CR
>shc 1,512 CR
>rev 0 CR
>rfd CR EOT

4.2.13 Memory Save

Stores the current camera settings in the flash memory.

- Format S1 CMD CR, Format R2 >R CR >[MEM] CR >[SB] CR EOT
- CMD sav

<Example>

sav CR
>OK CR
>sav CR EOT

4.2.14 Returning the Camera Settings to the its original status

Returns the current camera settings.

- Format S1 CMD CR, Format R2 >R CR >[MEM] CR >[SB] CR EOT
- CMD sta

<Example>

sta CR
>OK CR
>Type=XCM2080SAT4 CR
>Ver.=1.00_0x8012 CR
>Serial=123456 CR
>Sensor=12 CR
>Background Offset=3 CR
>Latter Harf of Tap Order=0 CR
>gax 1 CR
>gdx 0 CR
>odx 0 CR
>inm 0 CR
>int 2,1974 CR
>voa 0,0 CR
>tpn 0 CR
>shc 1,512 CR
>rev 0 CR
>sta CR EOT

4.3 Internal Circuit Configuration Block

The internal circuit configuration block of XCM2080SAT4、XCM2040SAT4 is shown below.

FPGA receives the digital output from CMOS image sensor, and converts the data into Camera Link Medium Configuration or Base Configuration.

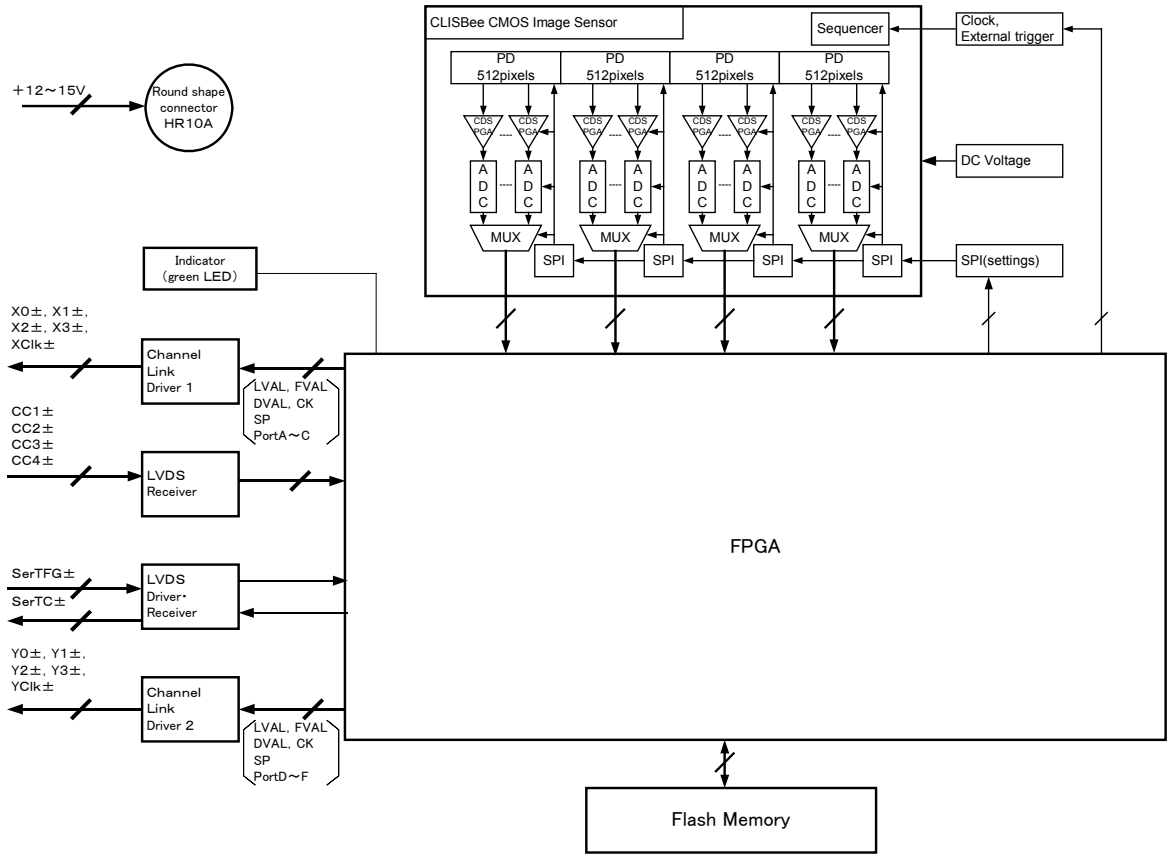


Figure 4-3-1 Internal Circuit Configuration Block of Camera

4.4 **Digital Processing flow in FPGA**

The digital processing flow in FPGA is shown below.

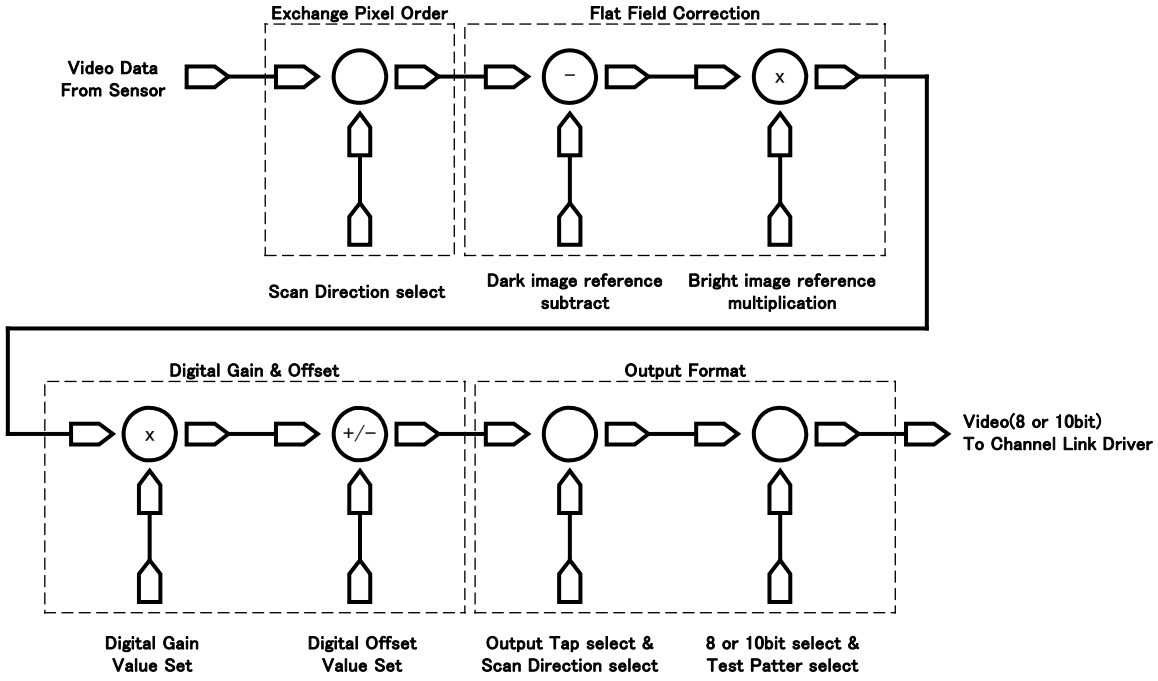


Figure 4-4-1 FPGA Processing Block Diagram

4.5 Startup

After turning on, the camera run a startup procedure before it starts getting images and outputting data. It takes about four seconds.

The start-up is executed by the following sequence, and as for the camera, the preparation for the image acquisition and the output is complete when normally ending.

(1) The camera hardware initializes. The indicator (LED green) blinks.

(2) Reads out the latest camera settings from the flash memory. (User settings if any or factory default settings)

(3) Set up the camera with the setting value from the flash memory.

The indicator (LED green) changes from blinking into lighting.

4.6 Saving and Loading Camera Settings

The camera settings data is saved in the internal memory (flash memory) and is loaded from the memory when turning on the power supply or loading (sending the "rfd" command).

Commands for rewriting the memory are as follows.

- Reset to factory settings (rst)
- Store present setup data in memory (sav)
- Store pixel correction data in memory (wht)

Notes:

1) The number of times the flash memory can be rewritten will vary depending on actual operational conditions.
2) After turning on the power supply, the camera always checks the memory status. When it is content outside a set range due to the breakdown etc., it automatically rewrites it in the memory setting value when the factory is shipped.
3) If the camera power is disconnected while rewriting the memory, the whole data saved in the memory will be deleted.
4) As it takes several seconds to rewrite the memory, do not disconnect power supply before receiving the answer from the camera.
5) Please do when you change the exposure mode from factory setting with externaltrigger signal (CC1) supplied from the frame grabber board side. If you do not send CC1 or sending control input signals are out of the designated range, you cannot get images and cannot change the settings. See 4.9.2 and 4.9.3.

Table 4-6-1 Camera Operation Mode and Control Input

Camera operation mode (Exposure mode)	Control input (From frame grabber board)
Free Run(Programmable time setting) (Factory Setting)	Not in use
Ext Edge (External trigger edge + Programmable time setting)	External trigger (CC1) is required
Ext Level (External trigger level time setting)	External trigger (CC1) is required

4.7 Serial Communication Settings

Serial communication is performed through the Camera Link Interface

Table 4-7-1 shows serial communication settings.

Table 4-7-1 Serial Communication Settings

Parameter Items	Setup Value
Communication Speed (Baud rate)	9600bps
Data Length	8bit
Parity Bit	None
Stop bit	1bit
Flow Control	None

4.8 Video Output Format

The camera outputs 8-bit or 10-bit digital data through 4 taps or 2Tap.

When 8bit is output, high rank 8bit is output as video data though the A/D converter resolution is 10bit.

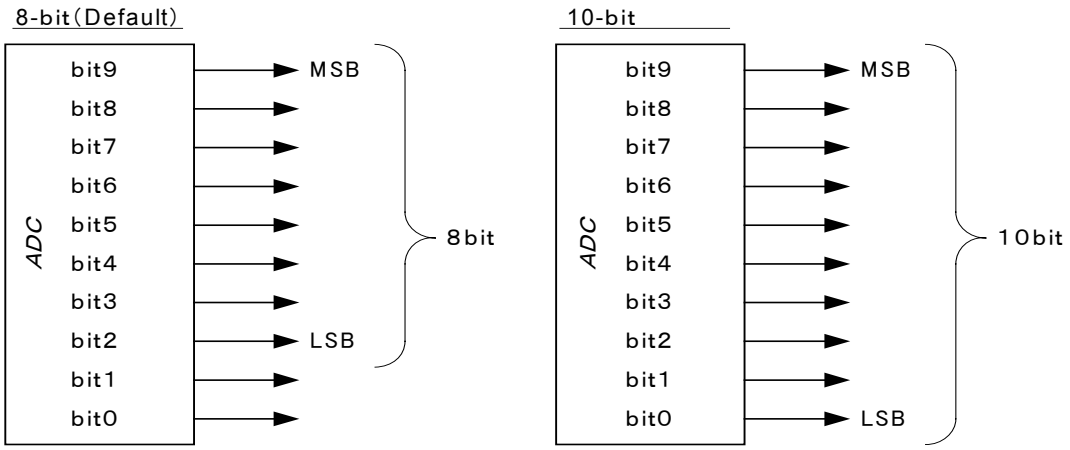


Figure 4-8-1 Pin Assignments of Digital Data

As for the output pattern, three following patterns can be selected.

① 4Tap/ 2048 pixel
② 2Tap/ 1024 pixel
③ 2Tap/ 2048 pixel

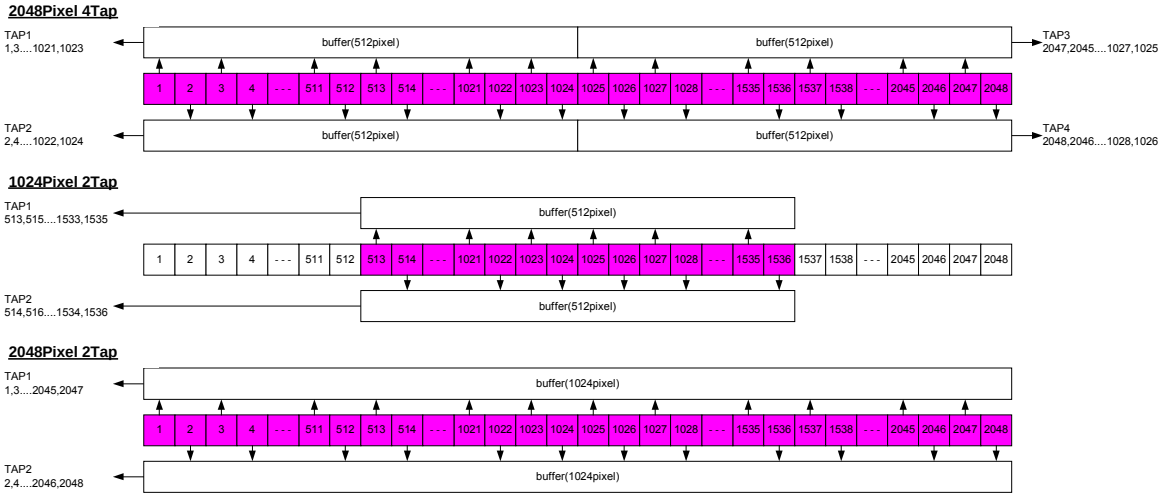


Figure 4-8-2 output pattern

Notes:

1) It becomes Camera Link Medium Configuration when 4Tap is selected, and it becomes Base Configuration output when 2Tap is selected.
2) When 2Tap 2048 pixel output is selected, scan rate becomes about 1.8 times at 4Tap.

Video output phase of the camera is shown below.

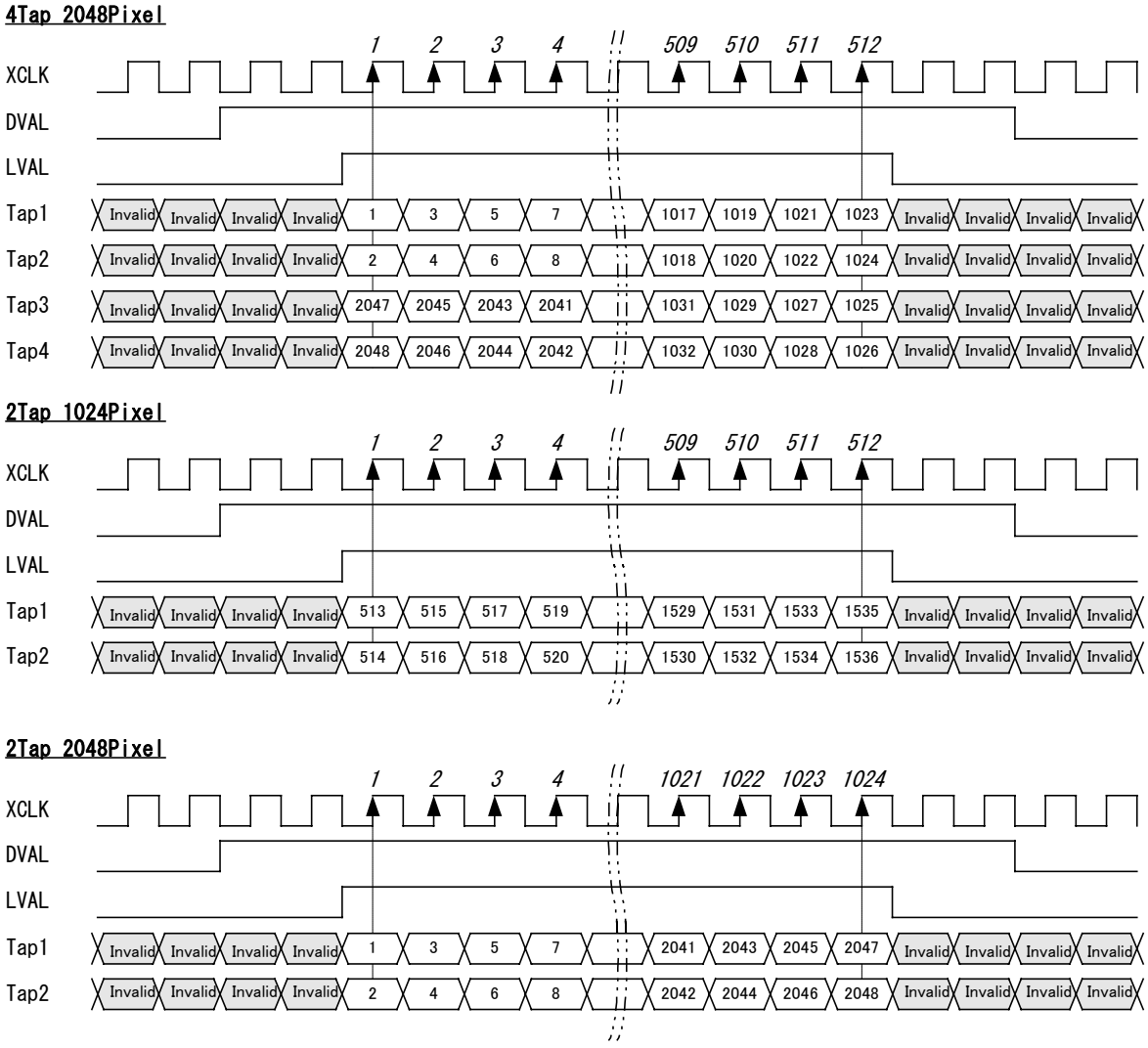

4Tap 2048Pixel
1 2 3 4 509 510 511 512
XCLK
DVAL
LVAL
Tap1 Invalid Invalid Invalid Invalid 1 3 5 7 1017 1019 1021 1023 Invalid Invalid Invalid Invalid
Tap2 Invalid Invalid Invalid Invalid 2 4 6 8 1018 1020 1022 1024 Invalid Invalid Invalid Invalid
Tap3 Invalid Invalid Invalid Invalid 2047 2045 2043 2041 1031 1029 1027 1025 Invalid Invalid Invalid Invalid
Tap4 Invalid Invalid Invalid Invalid 2048 2046 2044 2042 1032 1030 1028 1026 Invalid Invalid Invalid Invalid
2Tap 1024Pixel
1 2 3 4 509 510 511 512
XCLK
DVAL
LVAL
Tap1 Invalid Invalid Invalid Invalid 513 515 517 519 1529 1531 1533 1535 Invalid Invalid Invalid Invalid
Tap2 Invalid Invalid Invalid Invalid 514 516 518 520 1530 1532 1534 1536 Invalid Invalid Invalid Invalid
2Tap 2048Pixel
1 2 3 4 1021 1022 1023 1024
XCLK
DVAL
LVAL
Tap1 Invalid Invalid Invalid Invalid 1 3 5 7 2041 2043 2045 2047 Invalid Invalid Invalid Invalid
Tap2 Invalid Invalid Invalid Invalid 2 4 6 8 2042 2044 2046 2048 Invalid Invalid Invalid Invalid

Figure 4-8-3 Video Output Phase of the Camera

Note:

FVAL = 0 (low level) fixed

4.9 Exposure Mode and Timing Chart

The camera has three exposure modes. The overview of each mode and the timing are as follows.

4.9.1 Free Run Exposure Mode (Programming time setting)

In free-run exposure mode, the camera generates its own internal control signal based on two programmable parameters, exposure time and readout time.

Table 4-9-1-1 Programmable Exposure Time

Item	symbol	XCM2080SAT4	XCM2040SAT4
Programmable exposure time	P	6.7～3276.7(4TAP) 13.4～3276.7 (2TAP)	13.4～6553.4(4TAP) 26.8～6553.4 (2TAP)
Readout time	R	6.4(2K 4TAP,1K 2TAP) 12.8(2K 2TAP)	12.8(2K 4TAP,1K 2TAP) 25.6(2K 2TAP)
Scan Rate	S	8～3279.3(4TAP) 14.7～3279.3 (2TAP)	16～6558.6(4TAP) 29.4～6558.6(2TAP)

(unit::μs)

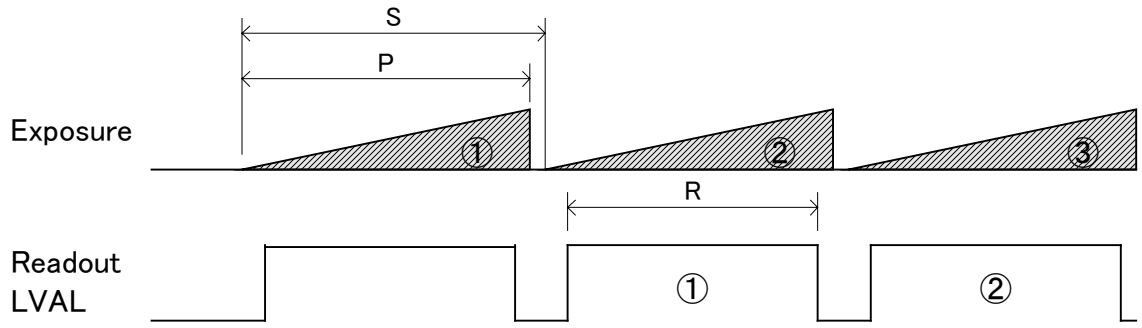


Figure 4-9-1-1 Free Run Exposure Mode

Note:

The timing of reading out does one scanning delay from the exposure.

4.9.1.1 Programmable exposure setting time and calculation of scan cycle

Calculation 1) P = Counter ÷ {Clock ÷ 2 ÷ Dividing}

Calculation 2) S = P + [{Padding + 6} ÷ {Clock ÷ 2 ÷ Dividing}]

P	Programmable exposure time (μs)
S	Scan rate (μs)
Clock	80 / 40(MHz)
Padding	20（fixed）
Dividing	2 / 4
Counter	134～32767

(Example) In case of Camera is ”XCM2080SAT4” and commando is ”int □2 □1000”

Clock = 80, Dividing = 2, Counter = 1000

Programmable exposure time (μs) = 1000 ÷ {80 ÷ 2 ÷ 2} = 50

Scan rate (μs) = 50 + [{20 + 6} ÷ {80 ÷ 2 ÷ 2} = 51.3

4.9.2 External Trigger Exposure Mode (External trigger edge)

In external trigger exposure mode (Trigger Edge), the exposure time is determined by the setting for the line period parameter, each exposure starts with the rising edge and the line period is determined by the time from rising edge to rising edge of the internal control signal. The range of programmable exposure time, the timing chart of the exposure and the readout are shown below.

Table 4-9-2-1 Programmable Exposure Time

Item	symbol	XCM2080SAT4	XCM2040SAT4
Programmable exposure time	P	6.7～3276.7(4TAP) 13.4～3276.7 (2TAP)	13.4～6553.4(4TAP) 26.8～6553.4 (2TAP)
Readout time	R	6.4(2K 4TAP, 1K 2TAP) 12.8(2K 2TAP)	12.8(2K 4TAP, 1K 2TAP) 25.6(2K 2TAP)
Scan Rate	S	8～3279.3(4TAP) 14.7～3279.3 (2TAP)	16～6558.6(4TAP) 29.4～6558.6(2TAP)
Trigger pulse H time	T1	≧0.05	≧0.1
Trigger pulse L time	T2	≧0.05	≧0.1
Trigger pulse cycle	T3	≧S	≧S

(unit::μs)

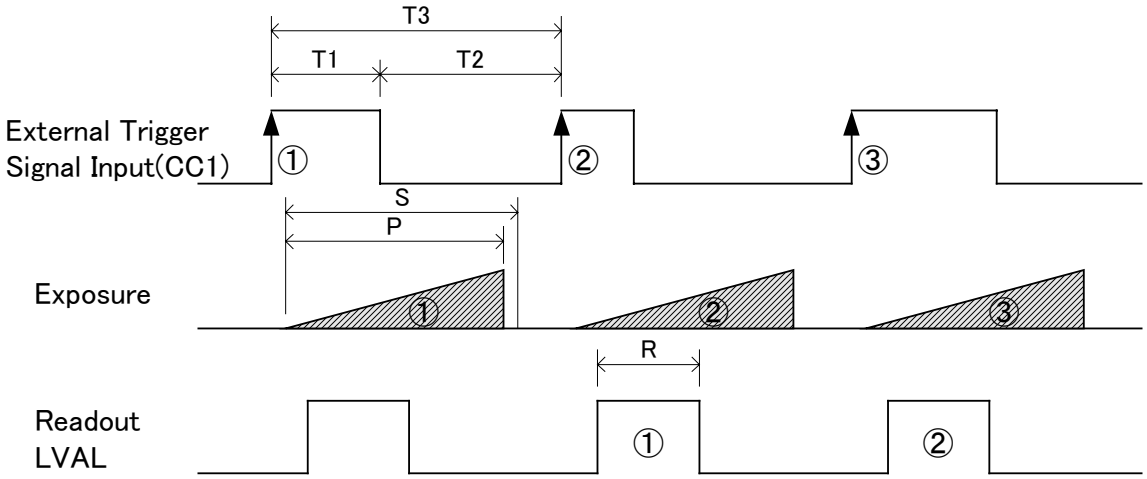


Figure 4-9-2-1 External Trigger (Trigger Edge) Exposure Mode

Notes:

1) The timing of reading out does one scanning delay from the exposure.

2) See 4.9.1.1 for the value of P and S

4.9.3 External Trigger Exposure Mode (Trigger Level)

In external trigger exposure mode (Trigger Level), the exposure time is determined by the setting for the line period parameter, each exposure starts with the rising edge and the line period is determined by high trigger pulse time. The range of programmable exposure time, the timing chart of the exposure and the readout are shown below.

Table 4-9-3-1 Programmable Exposure Time (Trigger Level)

Item	Symbol	XCM2080SAT4	XCM2040SAT4
Readout time	R	6.4(2K 4TAP, 1K 2TAP) 12.8(2K 2TAP)	12.8(2K 4TAP, 1K 2TAP) 25.6(2K 2TAP)
Trigger pulse H time (Exposure Time)	T1	≧6.7(4TAP) ≧13.4(2TAP)	≧13.4(4TAP) ≧26.8(2TAP)
Trigger pulse L time	T2	≧1.3	≧2.6
Trigger pulse cycle (Scan Rate)	T3	≧8(4TAP) ≧14.7(2TAP)	≧16(4TAP) ≧29.4(2TAP)

(unit::μs)

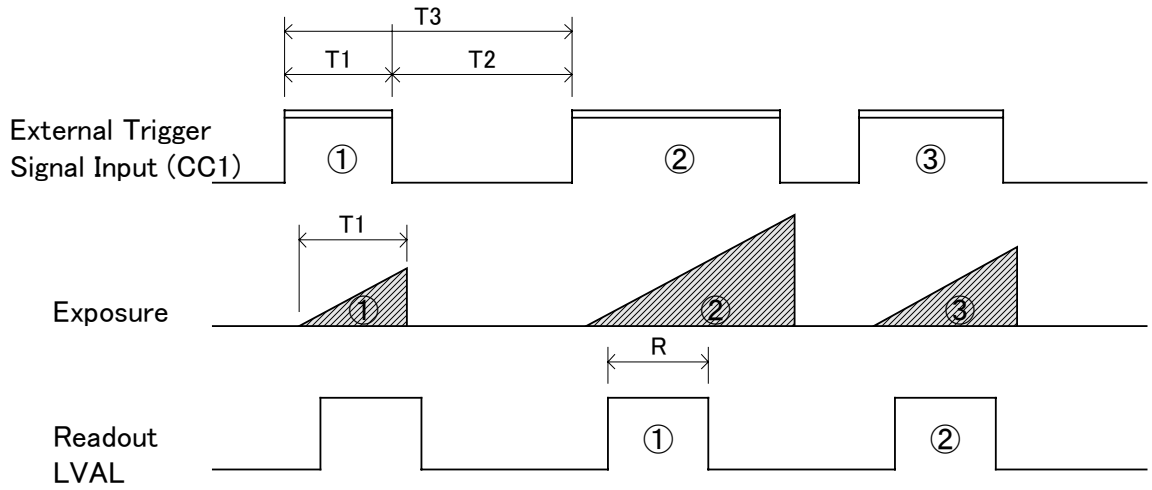


Figure 4-9-3-1 External Trigger (Trigger Level) Exposure Mode

Note:

The timing of reading out does one scanning delay from the exposure.

4.10 Setting Offset

The offset can be adjusted. It is possible to set it in the adjustable range of –60~60(DN) when 10bit is output –15~15(DN) when 8bit is output. It sets by command "odx "

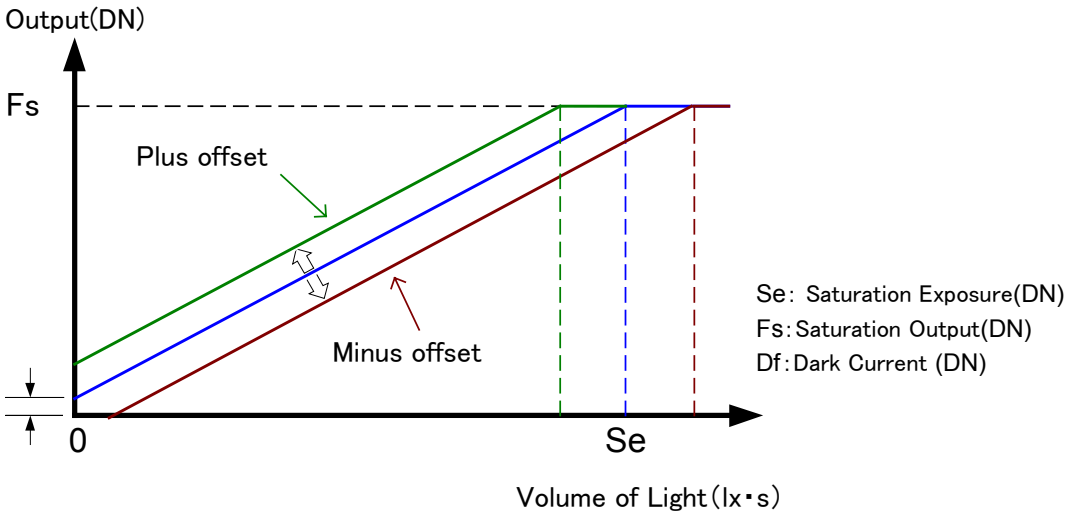


Figure 4-10-1 Saturation Exposure and Dark Current Output

Note:

1) Adjust amount of offset in accordance with the requirements of your camera system.

2) The gradients of lines do not change.

4.11 Setting Gain

The camera can adjust the analog gain (x1 to x20 in 7 steps) and the digital gain(x1 to x2 in 512 steps). As the diagram below indicates, increasing the gain setting increases the slope of the camera's response curve and results in a higher camera output for a given amount of light.

Analog gain can be changed by sending the "gax" command.

Digital gain can be changed by sending the "gdx" command.

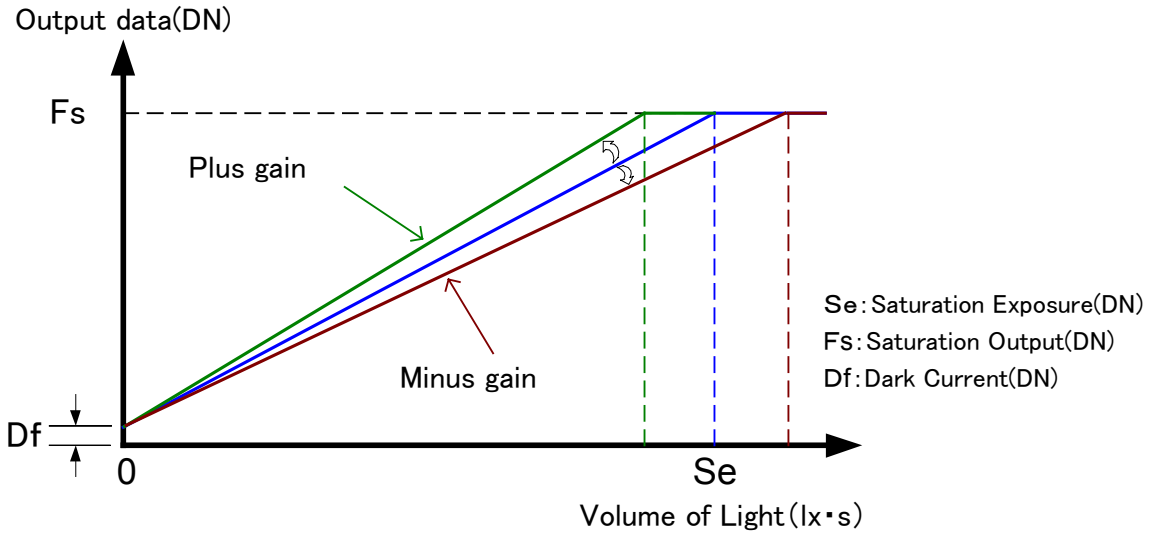


Figure 4-11-1 Gain Adjustment

Gain-Sensitivity of digital gain x1, pixel correction: default, (factory white correction data) is shown below.

Table 4-11-1 Gain-Sensitivity

	analog gain	Sensitivity V/(lx・s)
1	X1(0dB)	50
2	X2(6dB)	100
3	X4(12dB)	200
4	X8(18dB)	400
5	X10(20dB)	500
6	X12(22dB)	600
7	X20(26dB)	1000

Note:

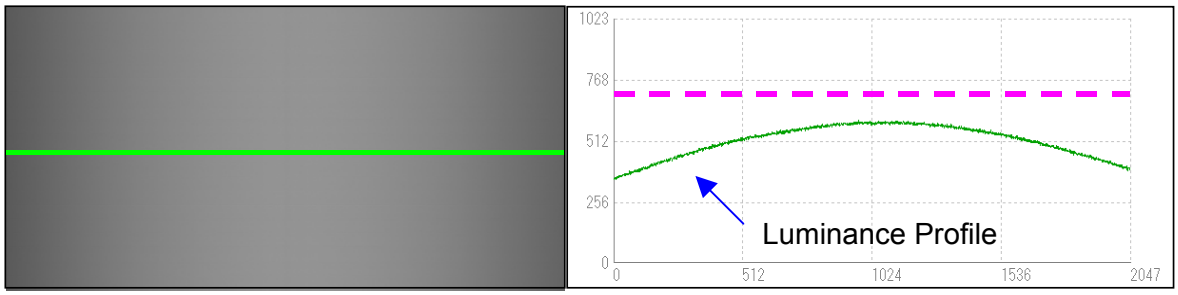
Gain and noise values are proportionally related. Adjust amount of gain in accordance with the requirements of your camera system.

4.12 Pixel Correction

Generally speaking, image sensors (CCD, CMOS and so on) have fixed pattern noise and photo response non-uniformity. When you use the lens, lens shadings and light sources also can cause non-uniformity. The camera is set to the optimal correction before shipping in order to provide images of high grade. The camera also has the function of user white correction to cope with lens shading and non-uniform illumination.

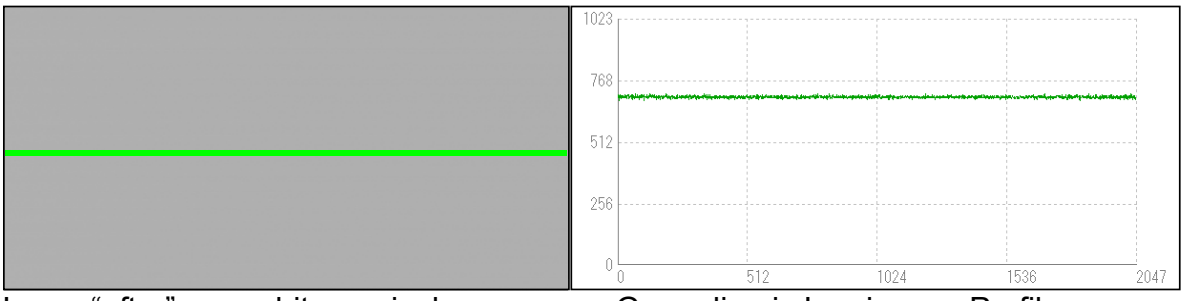
Cal_bl : Output data of each pixel at perfectly dark (factory correction)
Cal_wh : Output data of each pixel in uniform illumination (factory correction)
or in taking a picture of subject for correction (user white correction)

Target_Val : Target value for user correction (10bit output conversion value)
Vin:Input data (Before correction) Vout :Output data (After correction)
The corrected data is expressed in the following equation.
Vout=(Vin-Cal_bl) x Target_val / (Cal_wh-Cal_bl)



Image“before”user arbitrary pixel is corrected.

Green line is Luminance Profile



Image“after”user arbitrary pixel is corrected.

Green line is Luminance Profile

Figure 4-12-1 Waveform and image before and after bit correction

4.12.1 How to calibrate the camera

(1) Remove the lens cap and point it at the white illumination, in order to set a uniform wave level. Then you can acquire arbitrary white correction data. With a lens, the shading by both a lens and a light source will be simultaneously corrected. At this time, please defocus a little to avoid being affected by the un-uniformity of the object.
(2) Send the “wht” command through serial communication.
(3) Confirm that the camera returns “>OK” and “>wht”. Thus arbitrary white correction data is saved and loaded to the camera.
(4) Send the “shc 2 VAL2” command through serial communication. Then the arbitrary white correction will be on and set the correction level as “VAL2”.
Notes:

1) The numerical value of 0～1023 is input to above mentioned “Val” as a user correction target value.
2) The user correction target value is not full-scale output if it doesn't make it to a value that is a little larger than the acquired picture brightness.

4.13 Test Pattern

This camera can generate a test pattern. Use the test pattern to verify the proper timing and connections between the camera and the frame grabber board.

The test pattern of XCM2080SAT4/XCM2040SAT4 is below.

Figure 4-13-1 Test Pattern of 10bit 2048 Pixels

Figure 4-13-2 Test Image of 10bit 2048 Pixels

It increases in increments of 1DN to 255DN in order from the first pixel 0DN. This pattern is repeatedly output.

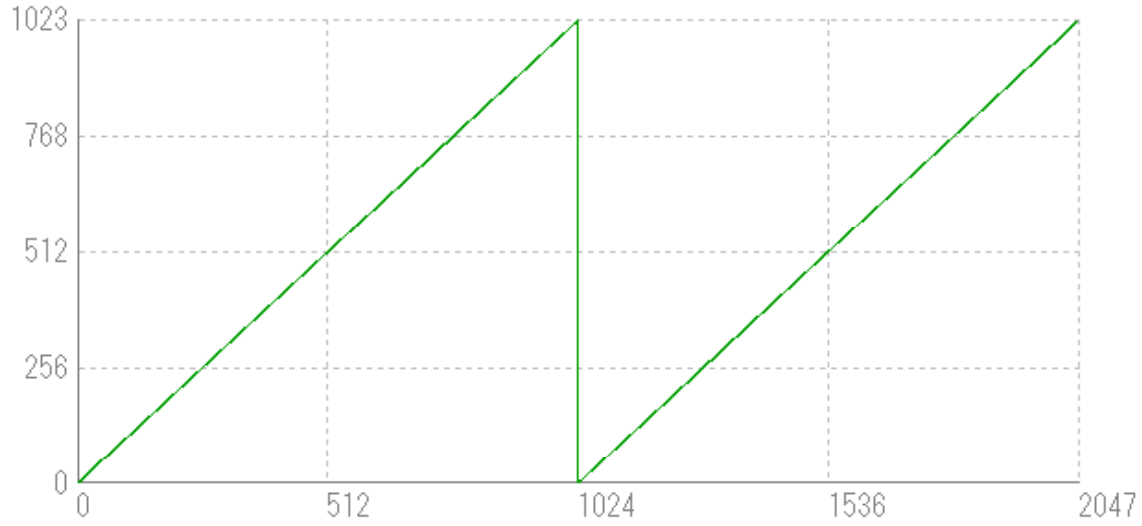


Figure 4-13-3 Test Pattern of 8bit 2048 Pixels

Figure 4-13-4 Test Image of 8bit 2048 Pixels

It increases in increments of 1DN to 1023DN in order from the first pixel 0DN. This pattern is repeatedly output.

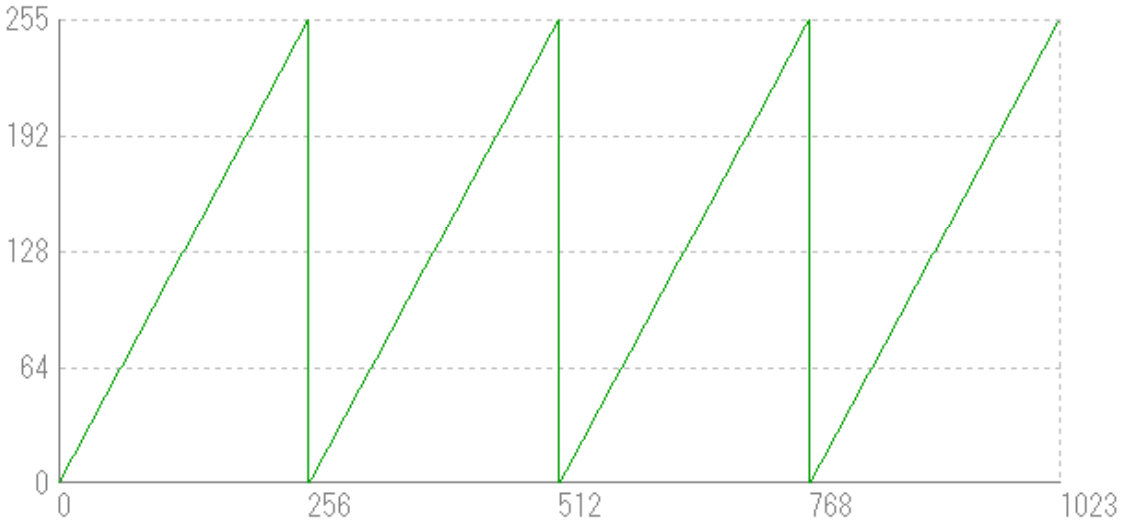


Figure 4-13-5 Test Pattern of 8bit 1024 Pixels Figure

4-13-6 Test Image of 8bit 1024 Pixels

It increases in increments of 1DN to 255DN in order from the first pixel 0DN. This pattern is repeatedly output.

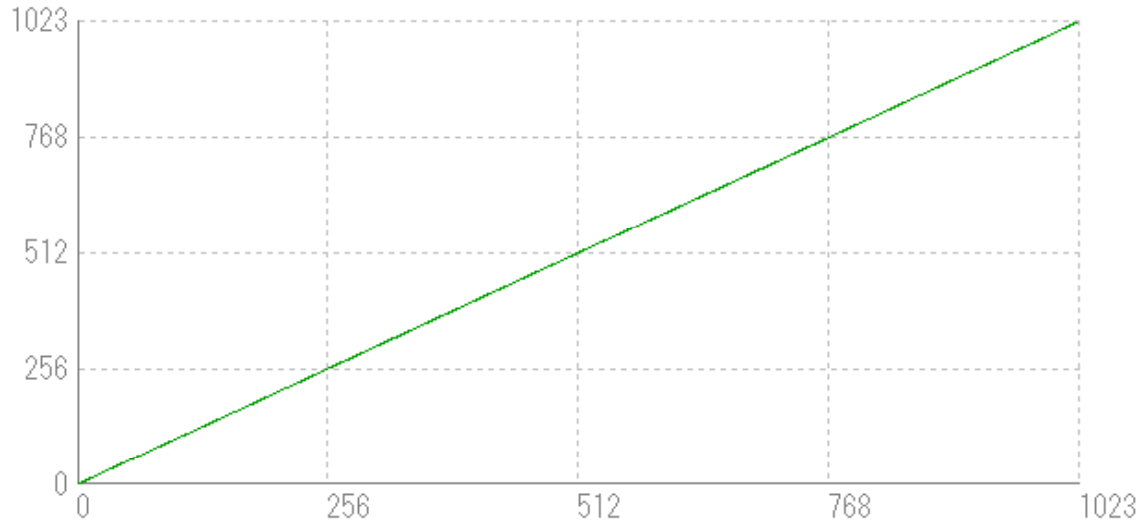


Figure 4-13-7 Test Pattern of 10bit 1024 Pixels Figure

4-13-8 Test Image of 10bit 1024 Pixels

It increases in increments of 1DN to 1023DN in order from the first pixel 0DN.

5 Confirming Camera Settings

5.1 Before Power-on

Please check the exterior for any damages that may have been caused during transportation or handling etc.

① Confirm the pin assignment of the power cable. (See table 3-3-2 and Figure 3-3-4)

② Confirm the direction and the channel of the cables. Some Camera Link cables are directional.

Note:

There is something that the connection direction is specified in the Camera Link cable. If one of the connectors says “Camera side”, connect it to the camera.

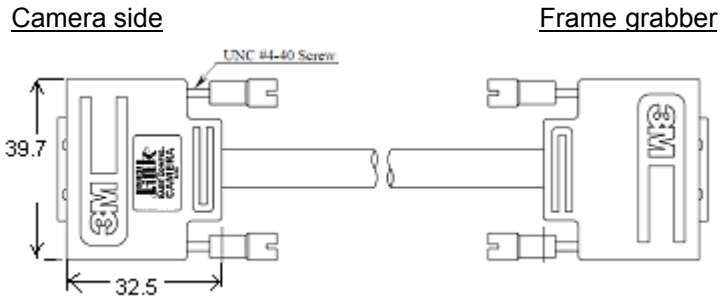


Figure 5-1-2 Connection Direction of Camera Cable

③Confirm the connection with the Camera Link cable and frame grabber.

The connection channel of in case of “Solios”

Camera side connector CL1 and frame grabber side connector CHANNEL#0 are connected. Camera side connector CL2 and frame grabber side connector CHANNEL#1 are connected.

CL1=CHANNEL#0 CL2= CHANNEL#1

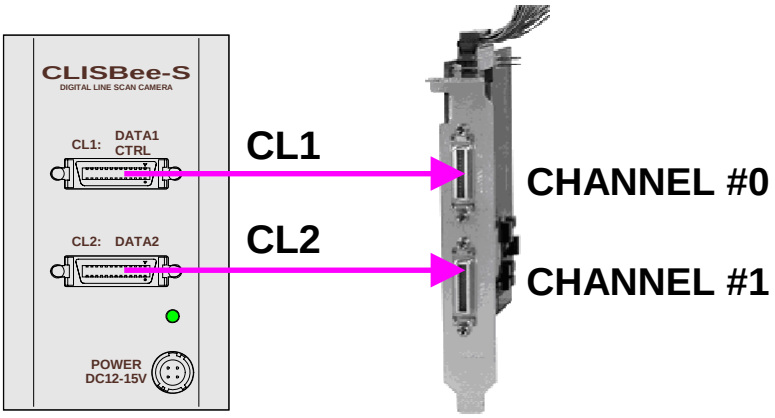


Figure 5-1-3 Channel of Camera Link Cables

5.2 After Power-on

(1) Confirm sent and received commands using the camera control utility. Launch CLISBeeCtrl, set COM port and connect. Click “Memory Dump” and wait for the response.

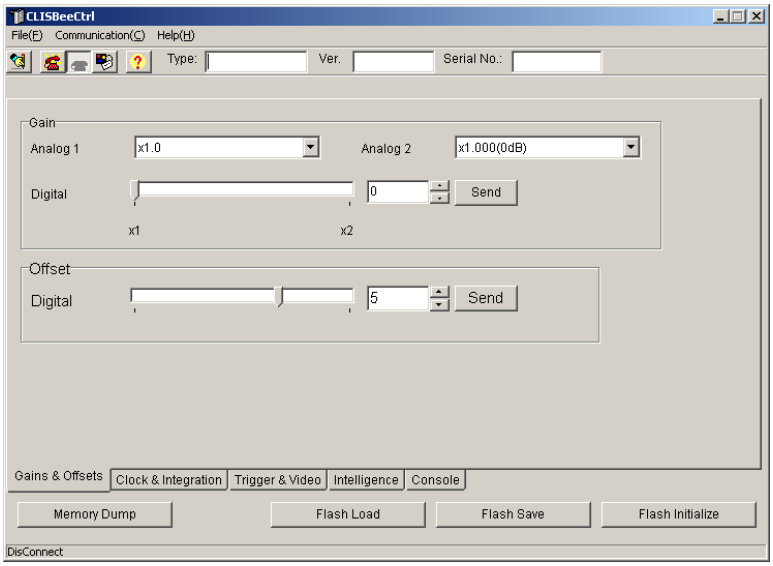


Figure 5-2-1 Confirmation of Connection

(2) Set a trigger mode and a video output mode with the camera control utility.

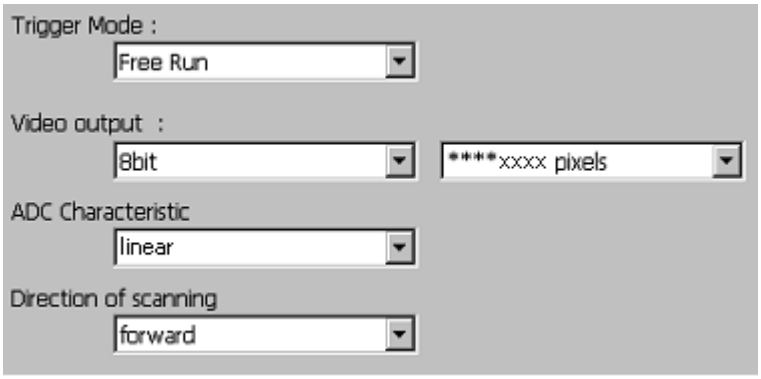


Figure 5-2-2 Setting of Exposure Mode and Video Output Mode

(3) Capture images using a camera interface board utility. In case of Matrox's Solios, it is convenient to use Intellicam.

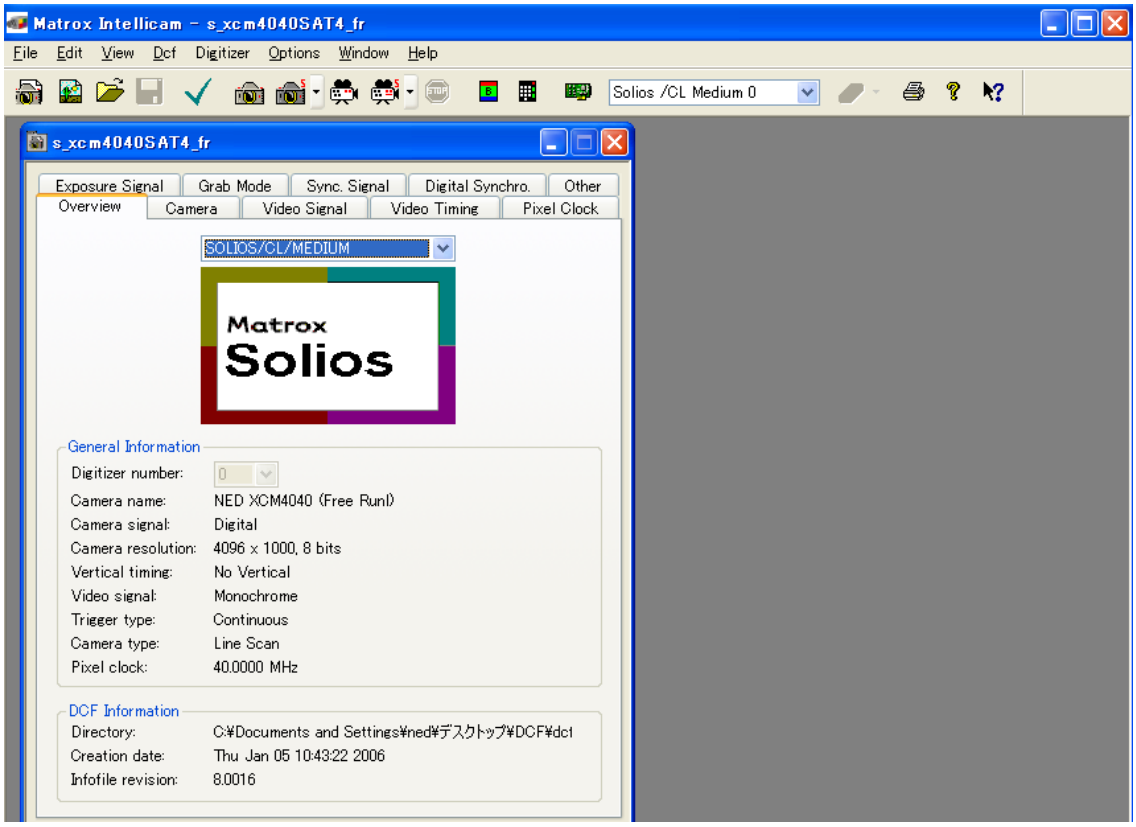


Figure 5-2-3 Solios Intellicam dcf Window

5.3 In Operation

(1) Does acquisition time out error occur?

<Cause>

① Captured images are too heavy.

Note:

If there are many filtering processes, the assignments to the driver may be insufficient.

②The cables are detached from the connector.

Note:

Ensure that the power cable and Camera Link cables are connected to the camera correctly.

③ Camera Link cables come under the influence of noise when the cables are laid near a light source inverter line or a power line.

Note:

The personal computer in use may be reset.

(2) Are there dark lines in the direction of vertical scanning on the image?

<Cause>

Dust on the sensor window.

Note:

Dust may come on the sensor window from the inside or the outside of the camera. Remove the dust with air or a lens cleaner.

6 Sensor Handling Instructions

6.1 Electrostatic Discharge and the Sensor

CMOS sensors are susceptible to damage from electrostatic discharge and can become defective.

6.2 Protecting Against Dust, Oil and Scratches

The CMOS sensor window is part of the optical path and should be handled like other optical components with care. If you use the camera in a dusty area, prepare a dust-proof enclosure. Dust can obscure pixels, producing dark lines on the image.

6.3 Cleaning the Sensor Window

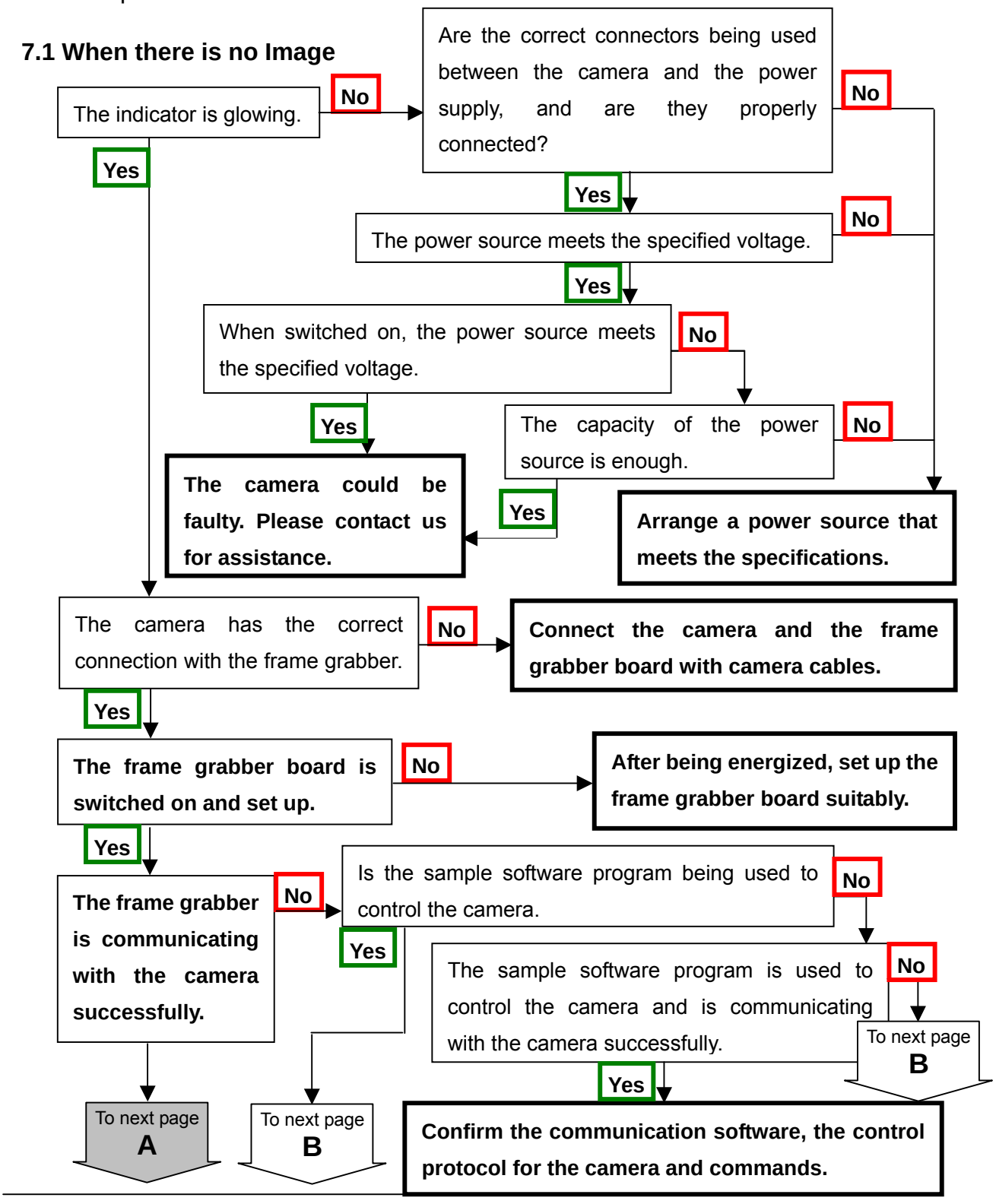
Dust: Can usually be removed by blowing the window surface using a compressed air blower.

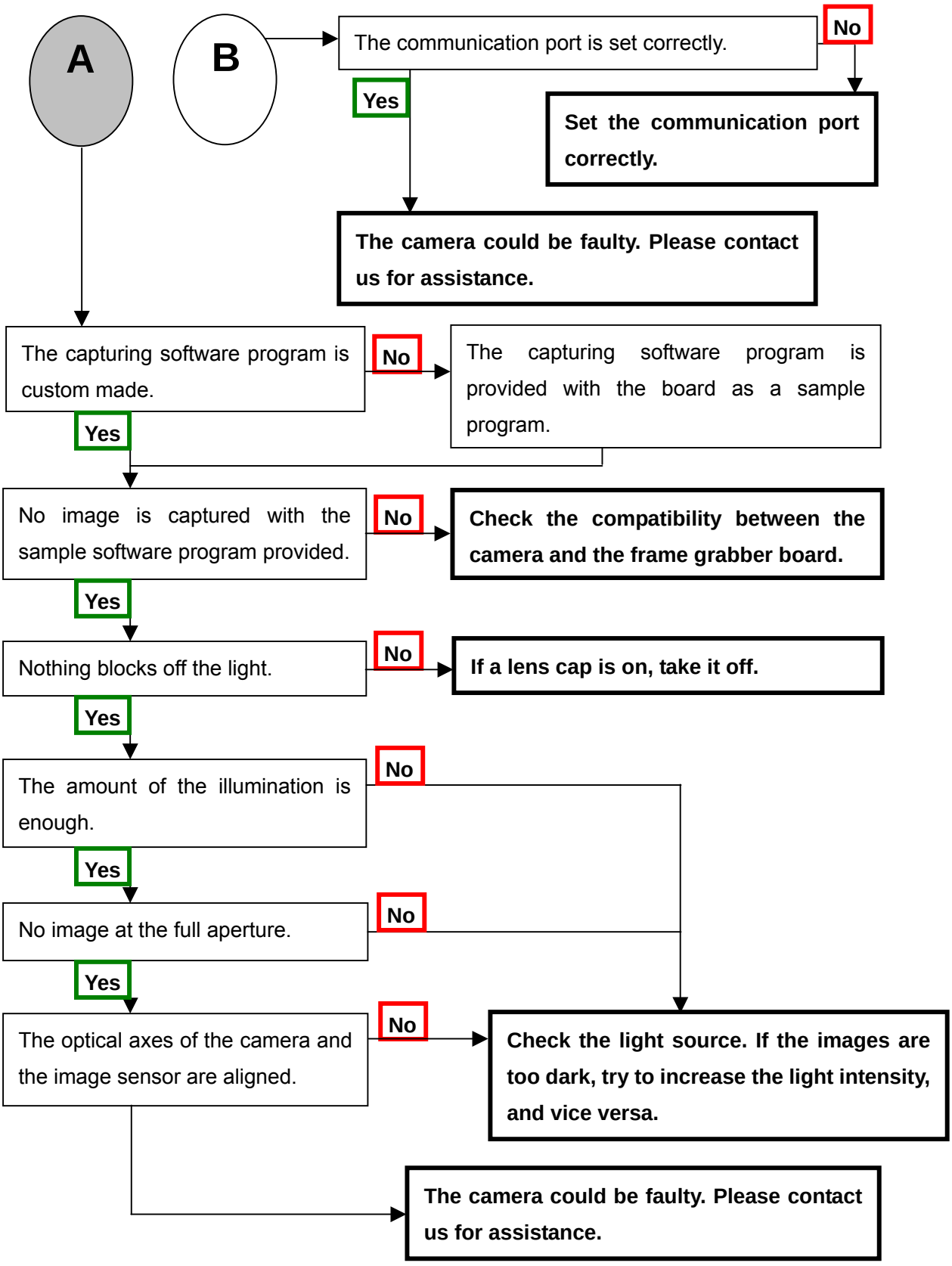
Oil: Wipe the window with a lint-free cloth wiper moistened with ethyl alcohol carefully and slowly.

7 Troubleshooting

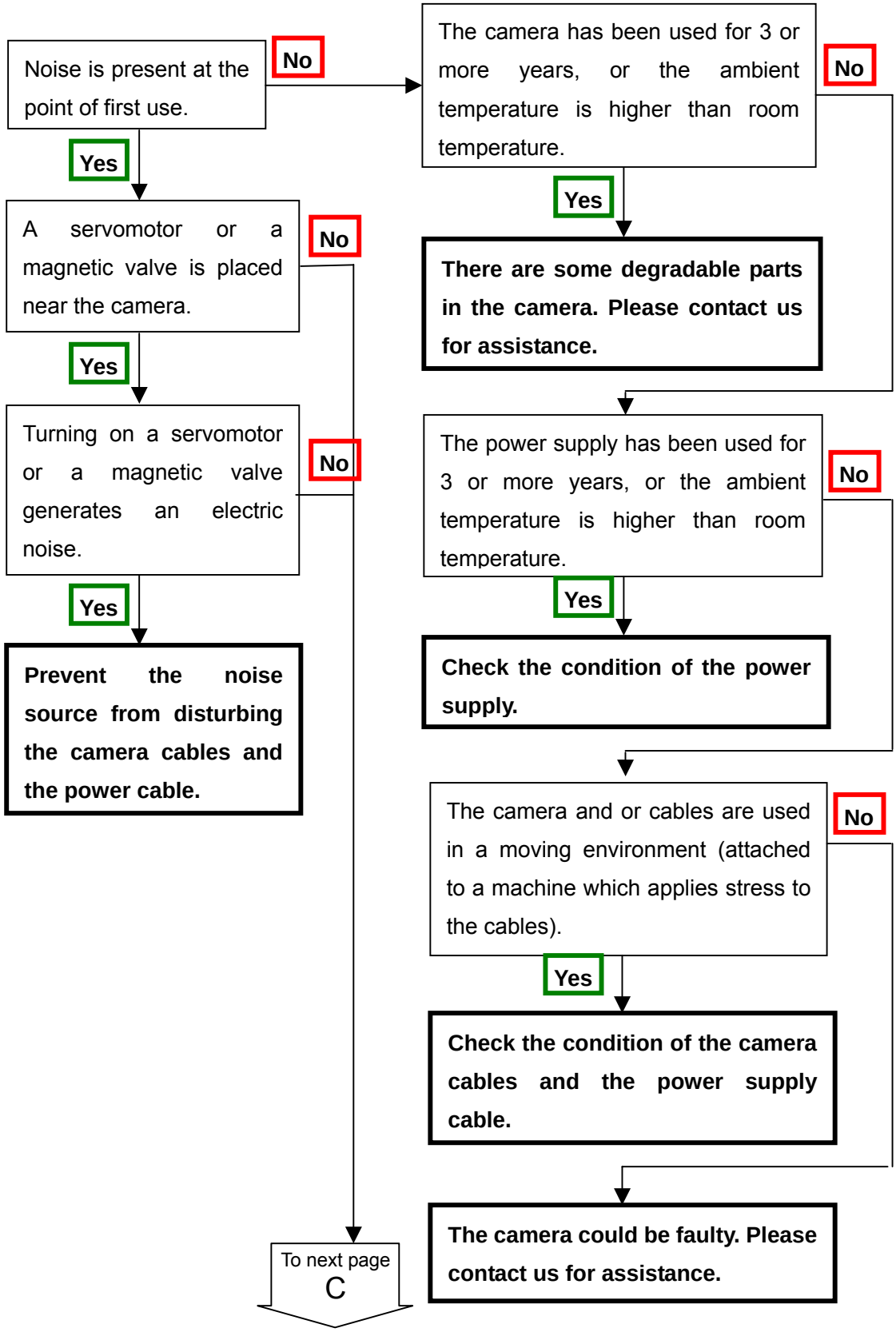
The following pages contain several troubleshooting charts that can help you find the cause of problems user sometimes encounter.

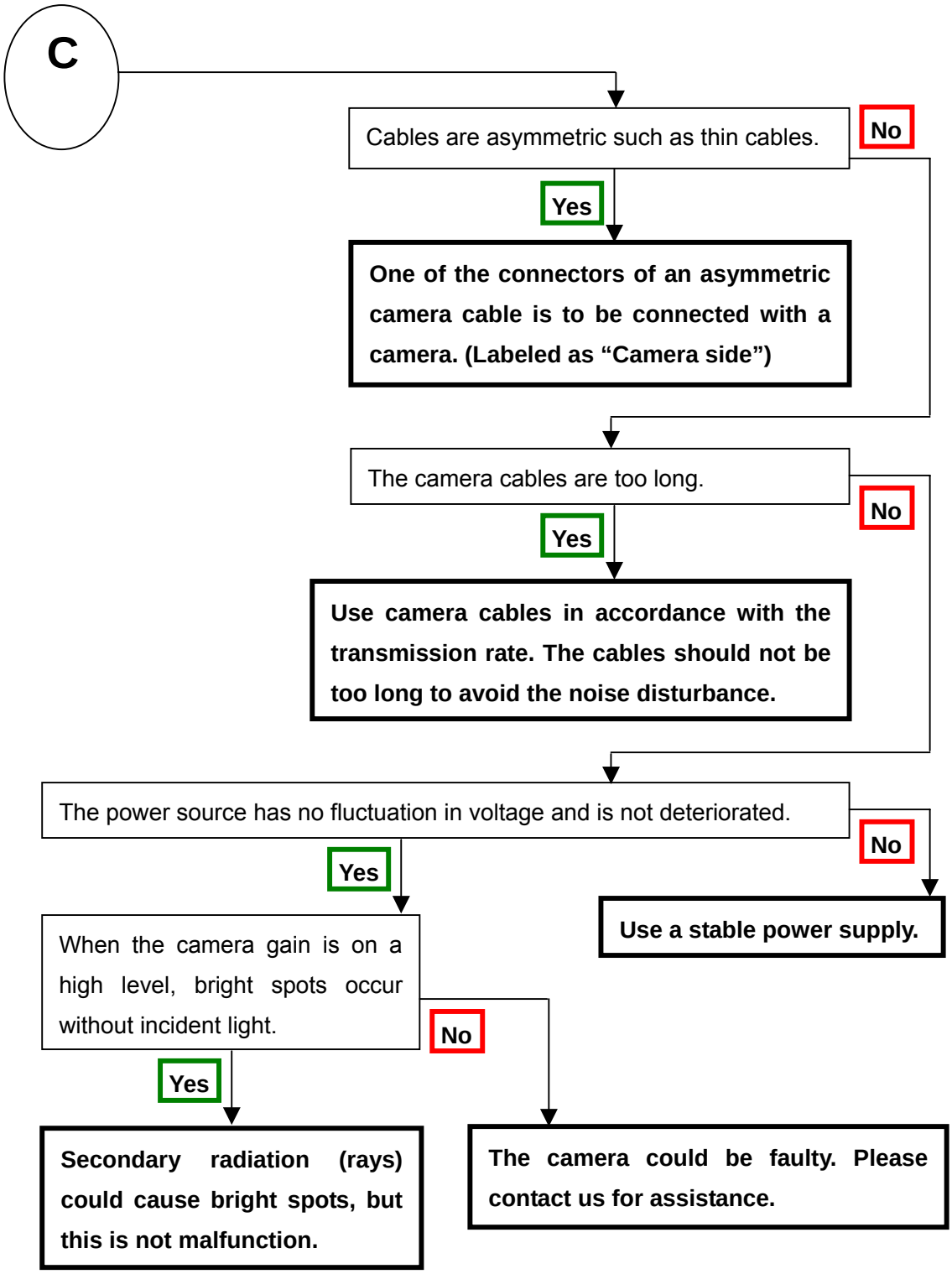
7.1 When there is no Image


The indicator is glowing.
No
Are the correct connectors being used between the camera and the power supply, and are they properly connected?
No
Yes
Yes
The power source meets the specified voltage.
No
Yes
When switched on, the power source meets the specified voltage.
No
Yes
The capacity of the power source is enough.
No
The camera could be faulty. Please contact us for assistance.
Yes
Arrange a power source that meets the specifications.
The camera has the correct connection with the frame grabber.
No
Connect the camera and the frame grabber board with camera cables.
Yes
The frame grabber board is switched on and set up.
No
After being energized, set up the frame grabber board suitably.
Yes
The frame grabber is communicating with the camera successfully.
No
Is the sample software program being used to control the camera.
No
Yes
The sample software program is used to control the camera and is communicating with the camera successfully.
No
To next page B
Yes
To next page A
To next page B
Confirm the communication software, the control protocol for the camera and commands.

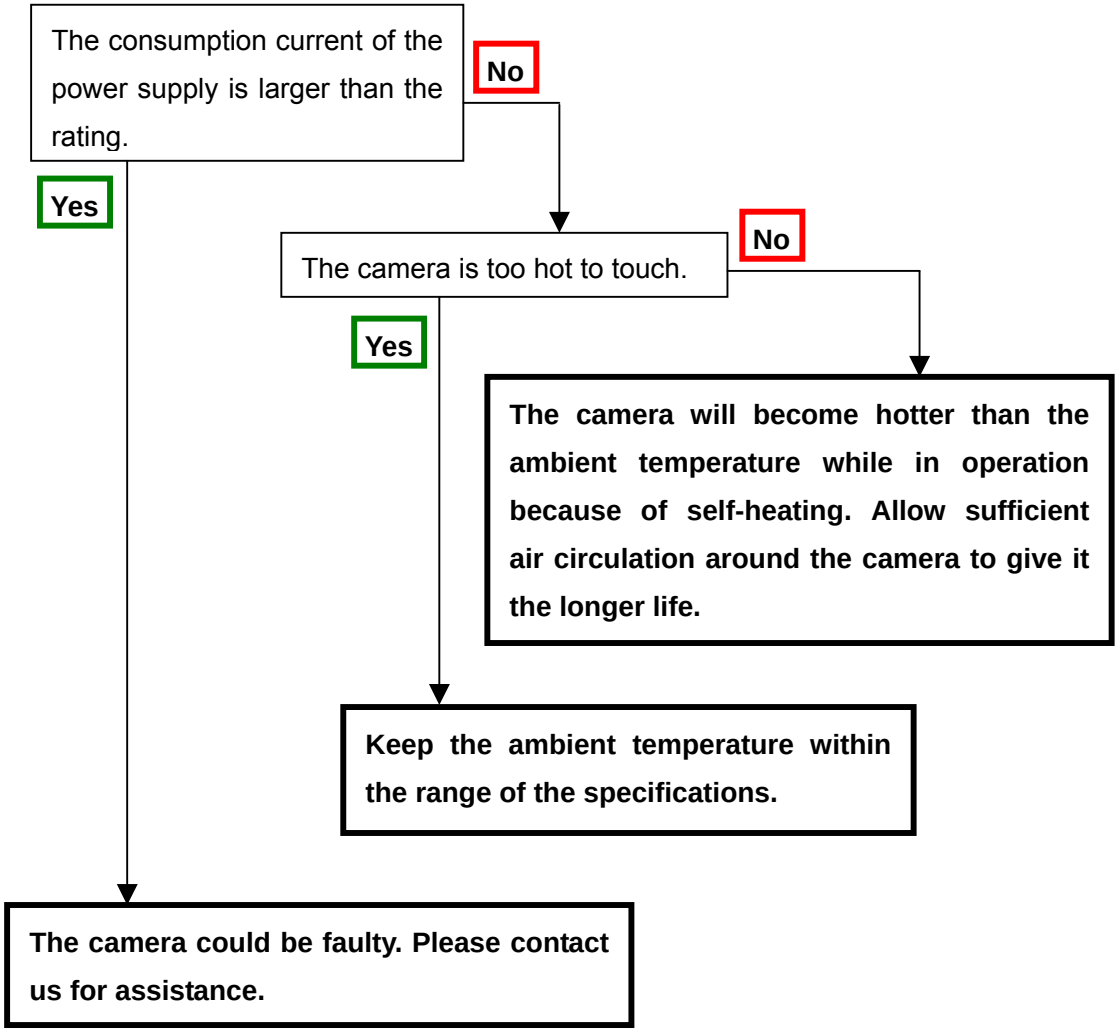

A
B
The communication port is set correctly.
No
Yes
Set the communication port correctly.
The camera could be faulty. Please contact us for assistance.
The capturing software program is custom made.
No
The capturing software program is provided with the board as a sample program.
Yes
No image is captured with the sample software program provided.
No
Check the compatibility between the camera and the frame grabber board.
Yes
Nothing blocks off the light.
No
If a lens cap is on, take it off.
Yes
The amount of the illumination is enough.
No
Yes
No image at the full aperture.
No
Yes
The optical axes of the camera and the image sensor are aligned.
No
Check the light source. If the images are too dark, try to increase the light intensity, and vice versa.
The camera could be faulty. Please contact us for assistance.

7.2 When Noise is present in the Image


Noise is present at the point of first use.
No
Yes
A servomotor or a magnetic valve is placed near the camera.
No
Yes
Turning on a servomotor or a magnetic valve generates an electric noise.
No
Yes
Prevent the noise source from disturbing the camera cables and the power cable.
The camera has been used for 3 or more years, or the ambient temperature is higher than room temperature.
No
Yes
There are some degradable parts in the camera. Please contact us for assistance.
The power supply has been used for 3 or more years, or the ambient temperature is higher than room temperature.
No
Yes
Check the condition of the power supply.
The camera and or cables are used in a moving environment (attached to a machine which applies stress to the cables).
No
Yes
Check the condition of the camera cables and the power supply cable.
The camera could be faulty. Please contact us for assistance.
To next page
C


C
Cables are asymmetric such as thin cables.
No
Yes
One of the connectors of an asymmetric camera cable is to be connected with a camera. (Labeled as “Camera side”)
The camera cables are too long.
No
Yes
Use camera cables in accordance with the transmission rate. The cables should not be too long to avoid the noise disturbance.
The power source has no fluctuation in voltage and is not deteriorated.
No
Yes
Use a stable power supply.
When the camera gain is on a high level, bright spots occur without incident light.
No
Yes
Secondary radiation (rays) could cause bright spots, but this is not malfunction.
The camera could be faulty. Please contact us for assistance.

7.3 When the Camera becomes hot


The consumption current of the power supply is larger than the rating.
No
Yes
The camera is too hot to touch.
No
Yes
The camera will become hotter than the ambient temperature while in operation because of self-heating. Allow sufficient air circulation around the camera to give it the longer life.
Keep the ambient temperature within the range of the specifications.
The camera could be faulty. Please contact us for assistance.

8 CLISBeeCtrl

8.1 Overview

The CLISBeeCtrl is the remote control software for “CLISBee*” camera using “**N**ED **C**amera **C**ontrol **P**rotocol”(NCCP) from a PC.

Connectable interfaces are following.

1) Camera Link API
2) Communication Port (COM port, RS232C)

*CLISBee is the nickname for XCM series camera.

8.2 System Requirements

PC: PC/AT compatible

Operating System: Microsoft Windows 2000 or XP. (Windows Vista: not confirmed)

Free disk space: 1-2MB (It may fluctuate with the number of camera parameter files.)

Connection: Camera Link frame grabber board, Camera Link cables

8.3 Install

Copy the CLISBeeCtrl folder in the media (CD-ROM, etc) which our company provides, to your hard disk.

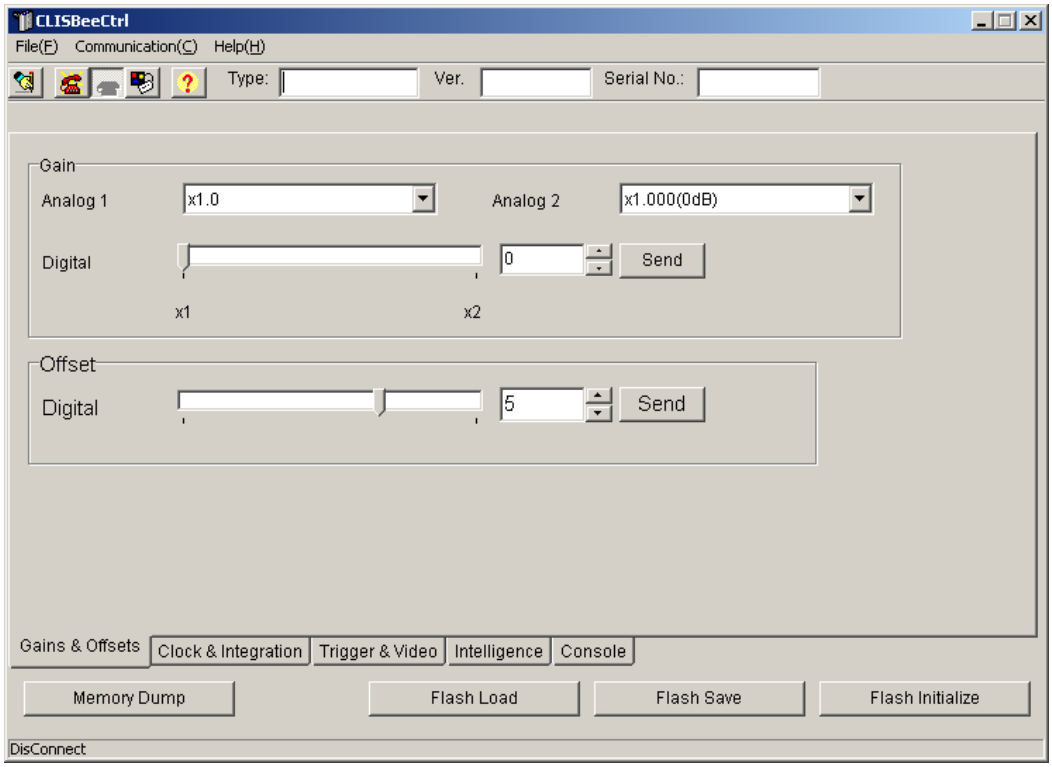
8.4 Uninstall

Remove the CLISBeeCtrl folder and all files in CLISBeeCtrl folder.

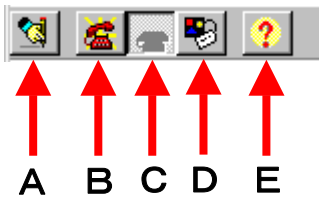
8.5 Operation

8.5.1 Start Program

Open Windows Explorer and Double-click the “CLISBeeCtrl.exe”.



It is possible to switch the page by clicking each tab under the window.



Buttons in the tool-bar have the following functions.

A: Exporting parameters in the text file format.

B: Connection with the camera.

C: Disconnection.

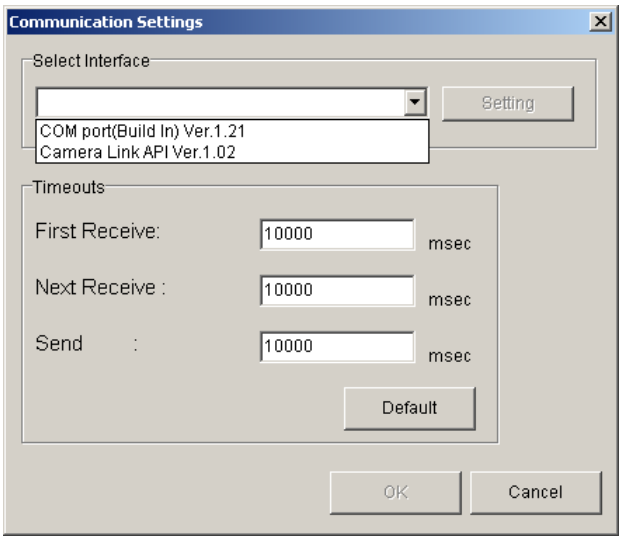
D: Setting Communication.

E: Version Information.

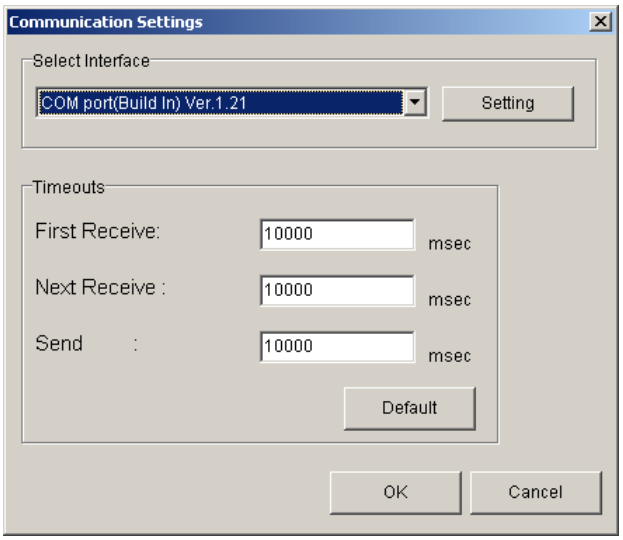
8.5.2 Selecting interface and Timeout setting

8.5.2.1.Selecting interface

1) Click button D.



2) Select the interface in Drop-down-list-box.



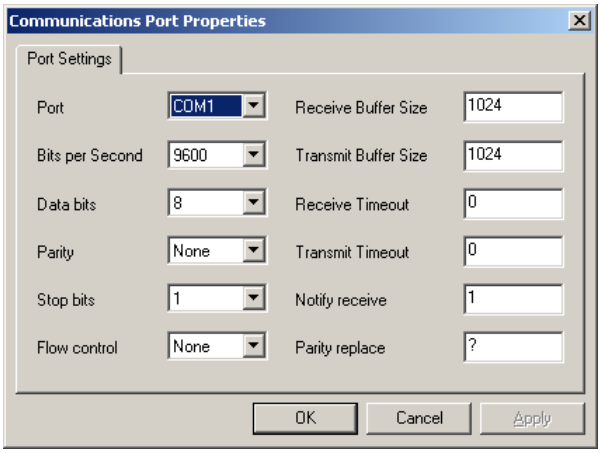
3) Click “Setting” button to set the interface. (See 8.5.2.2. and 8.5.2.3.)

4) Click “OK” button.

Click “Cancel” button when stopping setup.

Note: The camera can be used without this operation after it has been set up correctly.

8.5.2.2 Setting Communication port



1) Set up each item as follows. (NED standard)
However, when the setup which differs to the camera to connect is shown, follow there.

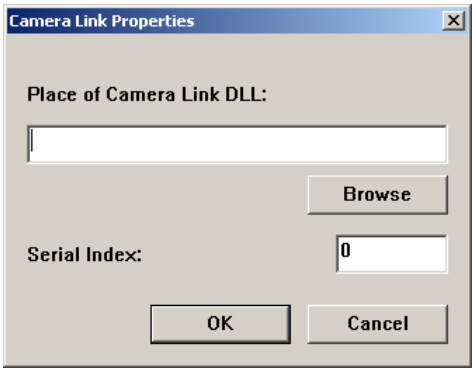
(1) Port: Select connecting port.
(2) Bits per Second: 9600
(3) Data bits: 8
(4) Parity: None
(5) Stop bits: 1
(6) Flow control: None

Note: Other parameters are not used.

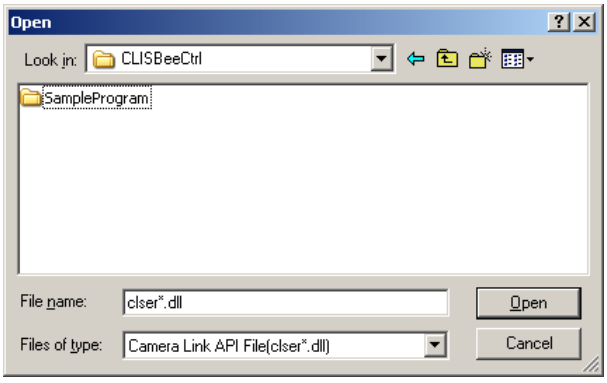
2) Click “OK” button.
Click “Cancel” button when stopping setup.

Note:
The camera can be used without this operation after it has been set up correctly.

8.5.2.3 Setting Camera Link API



1) Input the DLL file name for Camera Link API by edit-box,
Or click “Browse” button and select this file.



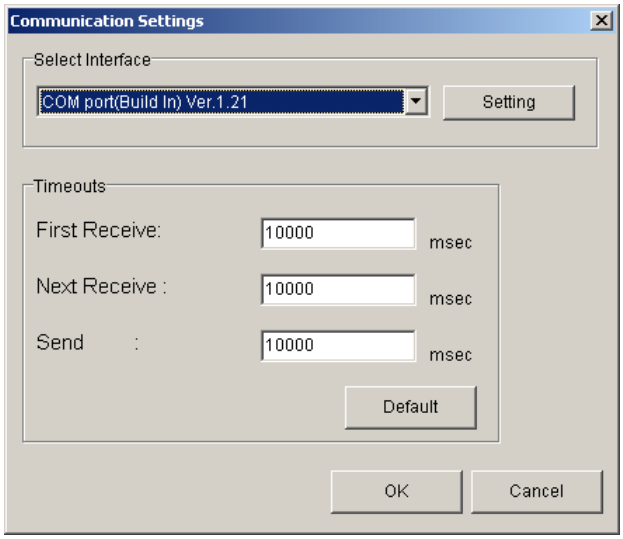
2) Input value corresponding to the position of Camera Link cable to connect, into “Serial Index” column.

3) Click “OK” button.
Click “Cancel” button when stopping setup.

Note: The camera can be used without this operation after it has been set up correctly.
Note: DLL for Camera Link API is provided by the manufacturer of the grabber board.

Some frame grabber boards are connected directly to the PC’s COM port, in this case, select interface to COM port (RS232C). Please contact the manufacturer of the grabber board for detail.

8.5.2.4 Setting Timeout



1) Input each timeout value in the edit-box.(unit :ms)
When you will click on the “Default” button, the value will be reset to the cameras default values.
The meanings of each timeout are as follows.

First Receive:	The maximum time from sending a command to receiving the first data.
Next Receive:	The maximum time between a letter and the next one.
Send:	The maximum time until finishing sending a command.

2) Click “OK” button.
Click “Cancel” button when stopping setup.
Note: The camera can be used without this operation after it has been set up correctly.

8.5.3.Connect

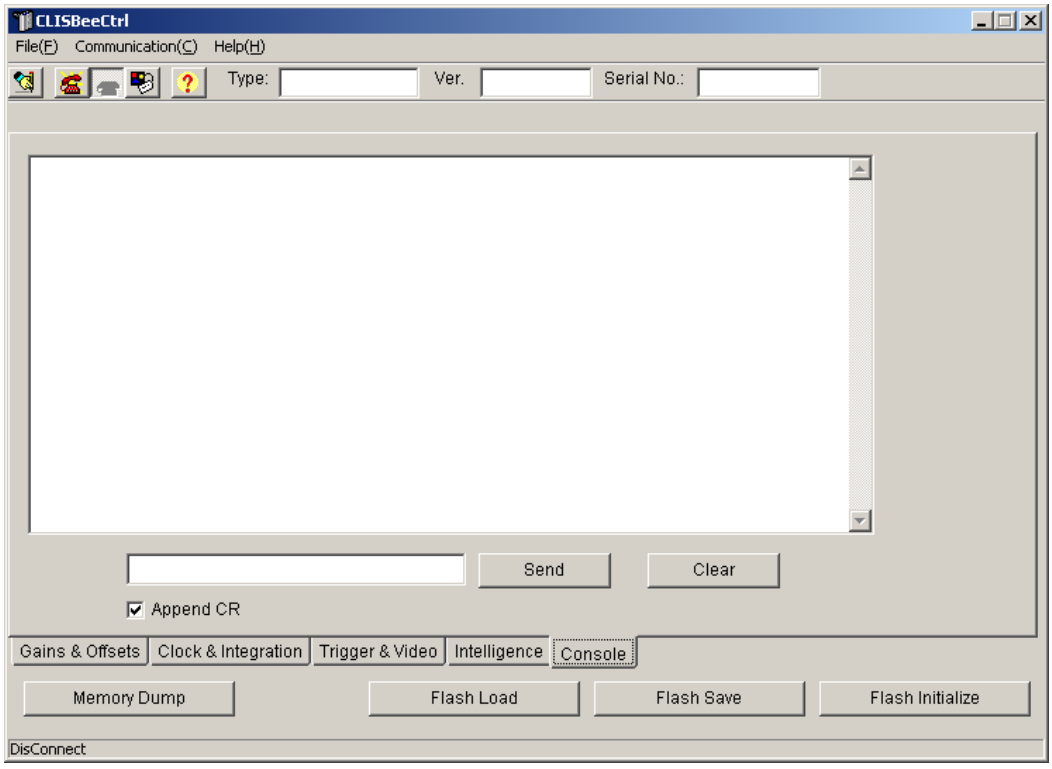
Click button B. Then you can control the camera. (See “8.6.Control”)
Click the “Memory Dump” button to acquire the current data of the camera.

8.5.4.Disconnect and end program

Click button C. Then click “X” button in the upper right of the window.

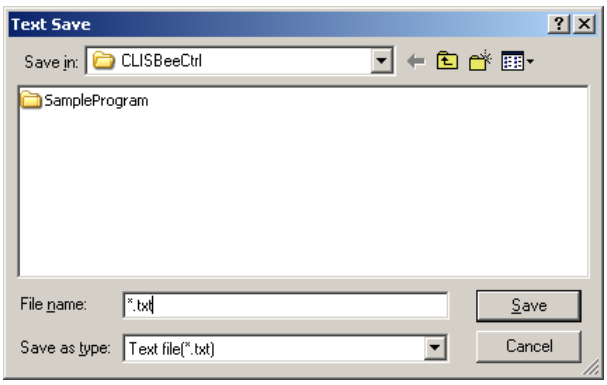
8.5.5.Check of the contents of communication

Click "Console" tag near the bottom window.



8.5.6.Export Parameters to text file

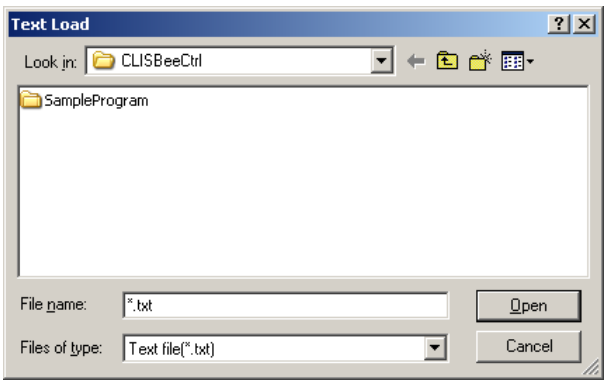
1) Click button A.



2) Input file name and click “Save” button. Present setting value of each control is saved by text format.

8.5.7.Import Parameters from text file

1) Select menu “File” – “Text Load”



2) Input file name and click “Open” button.
Each command preserved in the text file is issued one by one.

8.6 Control

8.6.1 Gains and Offsets

Operating it in『Gains & Offsets』tab.

< Gain >

Analog 1 :

The signal will be sent to the camera every time you make a selection from the menu in the drop-down-list-box.

Note:

This camera does not use 'Analog 2'

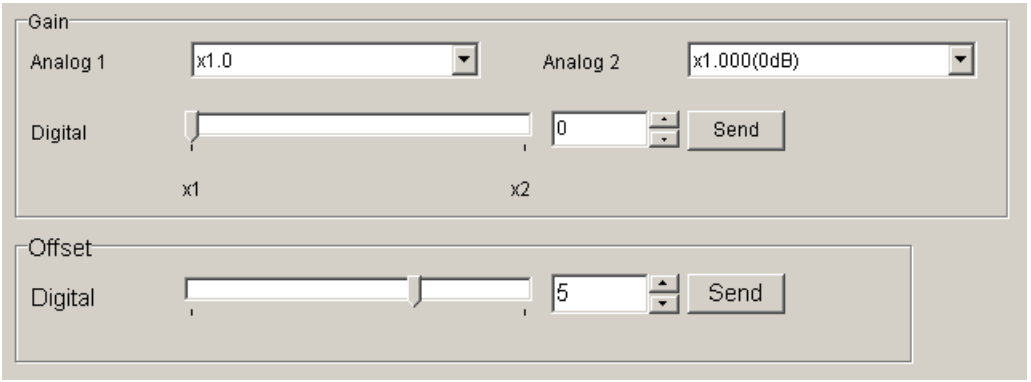
Digital :

Set a value with the slider, the edit-box or the spin-button. Then, click "Send" button.

< Offset >

Digital :

Set a value with the slider, the edit-box or the spin-button. Then, click "Send" button.



8.6.2 Clock & Integration

Operating it in『Clock & Integration』tab.

Clock :

Shows the camera internal clock frequency.

Note: **Read Only**

Integration Time :

Setting integration time. (Unit: μs) When the trigger mode is Free Run, and Ext Edge

Dividing / **Counter** :

First, choose a dividing clock from the drop-down-list-box.

Next, set a counter value with the slider, edit-box or the spin-button. Then, click “Send” button.

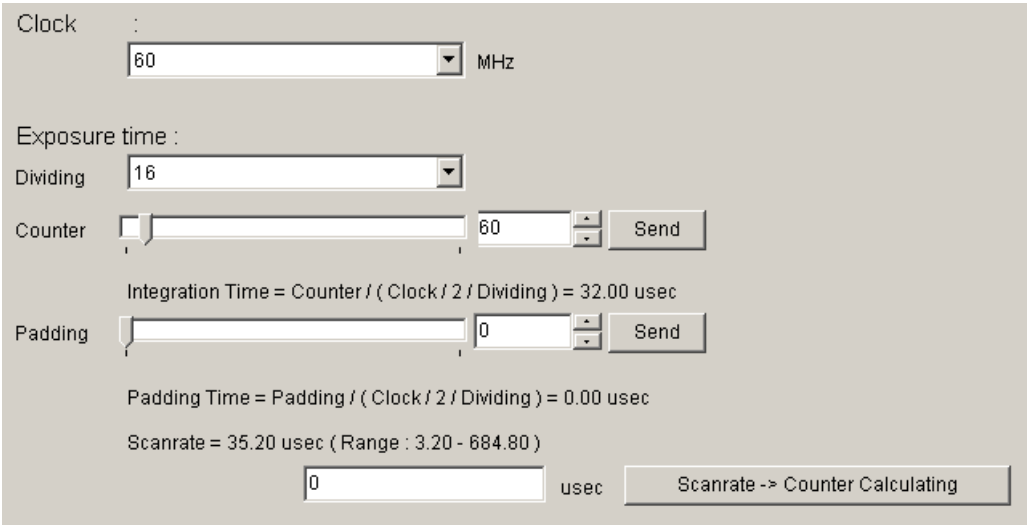
Padding : **Read Only**

Scanrate -> Counter automatic setting:

The Counter value of Clock, Dividing, and Padding is calculated and set from the present value when the scanning cycle to be set to the edit-box is input and it then click on the scanrate -> counter calculating button.

Note:

1) The calculating formula and the value at exposure time (Integration Time) are displayed by the unit of μs.
2) The calculating formula and the value of PaddingTime are displayed by the unit of μs.
3) The calculation value at scanning cycle (Scanrate) is displayed by the unit of μs.



8.6.3 Exposure mode (Trigger Mode) & Video output mode

Operating it in the『Trigger & Video』tab.

Exposure mode （**Trigger Mode**） :

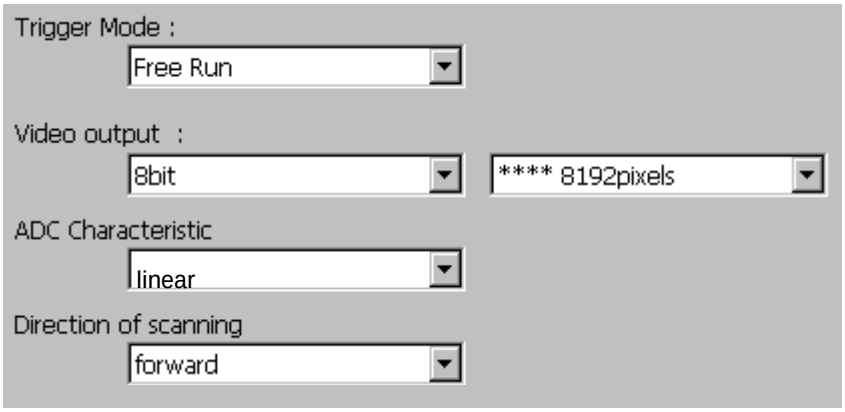
Select Free Run Exposure mode, External Trigger Exposure mode and External Trigger level. The signal will be sent to the camera every time you make a selection from the menu in the drop-down-list-box.

Video output :

Select the number of the output bit and the output block. The signal will be sent to the camera every time you choose make a selection from the menu in the drop-down-list-box.

Direction of scanning :

The order of outputting data from the camera is switched in positive direction (forward) or opposite direction (reverse).



8.6.4 Intelligence

Operating it in the『Intelligence』tab.

< Calibration >

Calib White :

Acquisition of white data and saving the calibration data to camera's flash memory.

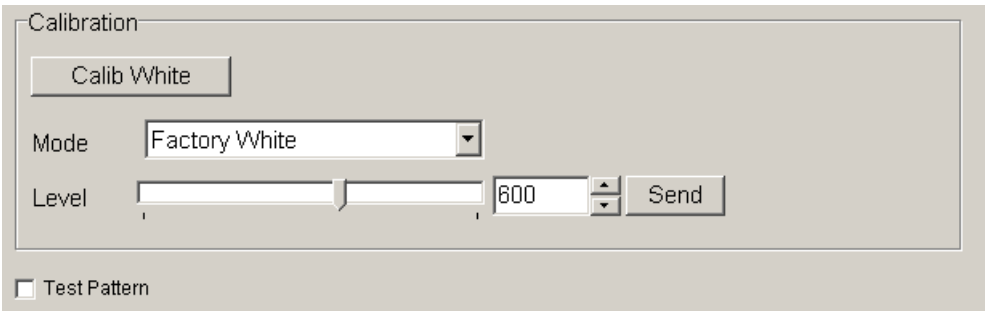
Mode / **Level** :

First, choose the mode from the drop-down-list-box.

Next, set a value with the slider, the edit-box or the spin-button. Then, click "Send" button.

Test Pattern :

ON/OFF of the test pattern output is switched clicking the check box.



8.6.5 Memory in camera

Memory Dump :

Read the data from the camera's work memory.

Flash Load :

Loading the data from the camera's flash memory.

Flash Save :

Saving the data in the camera's flash memory.

Flash Initialize :

Initializing the camera's flash memory with the factory standard data.

Note:

It takes a while to save and initialize.

8.7 Upgrade

When installing a newer / updated software version from our company,
Please perform in the following procedure.

1) Check the CLISBeeCtrl has not started.
2) Uninstall the old version software. (See “8.4.Uninstall”)
3) Install new version software. (See “8.3.Install”)

8.8 How to Program

Please refer sample programs in CLISBeeCtrl¥SampleProgram folder.

8.9 Attention on use

1) Reproducing and distributing without notice the part or all of this software and this book is prohibited.
2) Reverse engineering, decompiling, disassembling and modifying without notice the part or all of this software is prohibited.
3) The specification of this software and the contents of this book may be changed without announcement in future.

9 Others

9.1 Notice

- No part of this document may be reproduced in any form, in whole or in part, without the expressed written consent of NED.
- Contents of this document are subject to change without prior notice.
- Every care has been taken in the preparation of this User's Manual. If you should discover any errors or omissions, please notify your nearest NED representative.

9.2 Contact for support

Nippon Electro-Sensory Devices Corporation

Head Office
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9.3 Product Support

If there is still a problem with your camera after checking it in accordance with the troubleshooting guide, turn off the power and call your NED representative.

In such case, please inform us of the status of the camera. You can get the status by

(1) executing the “sta” command, or

(2) clicking “Memory Dump” button when using CLISBeeCtrl.

The example of the camera status.

```
sta
>OK
>Type=XCM2080SAT4 CR
>Ver.= 1.00_0x8012 CR
>Serial=123456 CR
>Sensor=12 CR
>Background Offset=3 CR
>Latter Harf of Tap Order=0 CR
>gax 1 CR
>gdx 0 CR
>odx 0 CR
>inm 0 CR
>int 2,1974 CR
>voa 0,0 CR
>tpn 0 CR
>shc 1,512 CR
>rev 0 CR
>sta CR EOT
```

Revision History

Revision Number	Date	Changes
01	24 Mar. 2010	Initial release